CHAPTER 15
CONSTRUCTION HOISTING AND RIGGING EQUIPMENT REQUIREMENTS

This chapter outlines the requirements for the safe use of hoisting and rigging equipment on construction projects at DOE installations.

INTENTIONALLY BLANK

15.1 GENERAL

The versatility of hoisting and rigging equipment makes it extremely useful on construction projects. Improper and unsafe use, however, can result in serious accidents.

This chapter is designed for use as a stand-alone document and may be used as part of the procurement process. It outlines minimum requirements for the safe use of hoisting and rigging equipment on construction projects at DOE installations.

15.2 DEFINITIONS

APPOINTED: Assigned specific responsibilities by the employer or the employer's representative.

AUTHORIZED: Assigned by a duly constituted administrative or regulatory authority to perform a specific function.

CRANE, MOBILE: For the purposes of this chapter, mobile cranes are defined as wheel-mounted cranes, truck cranes, and crawler cranes.

- A **wheel-mounted** crane consists of a rotating structure with power plant, operating machinery, and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by an engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure (see Figures 15-1, 15-3, 15-5, 15-6, 15-7, 15-9, and 15-10).
- A **truck-mounted crane** consists of a rotating superstructure with power plant that operates machinery and boom, mounted on an automotive truck equipped with a power plant for travel. Commercial truck-mounted cranes are included in this category (see Figures 15-3, 15-7, 15-9, and 15-10).
- A **crawler crane** consists of a rotating superstructure with power plant, operating machinery and boom, mounted on a base equipped with crawler treads for travel (see Figures 15-2 and 15-8).

DESIGNATED: Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

DESIGNATED LEADER: "An individual assigned responsibility for hoisting and rigging activities requiring more than one person".

FORKLIFT TRUCK: A high-lift self-loading truck equipped with load carriage and forks for transporting and tiering loads (see Figure 15-11).

LIFT, CRITICAL: A lift for which the application of requirements applicable to ordinary lifts would not adequately eliminate or control the likelihood or severity of the following:

- personnel injury or significant adverse health impact (onsite or offsite).
- significant release of radioactivity or other hazardous material or other undesirable conditions.
- undetectable damage that would jeopardize future operations or the safety of a facility.
- damage that would result in delay to schedule or other significant program impact such as loss of vital data.

LIFT, ORDINARY: Any lift not designated as a critical lift.

PERSON-IN-CHARGE (PIC): The manager or other responsible person (other than the equipment operator) known to be qualified and appointed to be responsible for the safe handling of critical loads.

Note: In the text, use of the imperative voice (as in "Ensure that the load is balanced") or of the term "shall" refers to mandatory actions, whereas the term "should" refers to recommended actions.

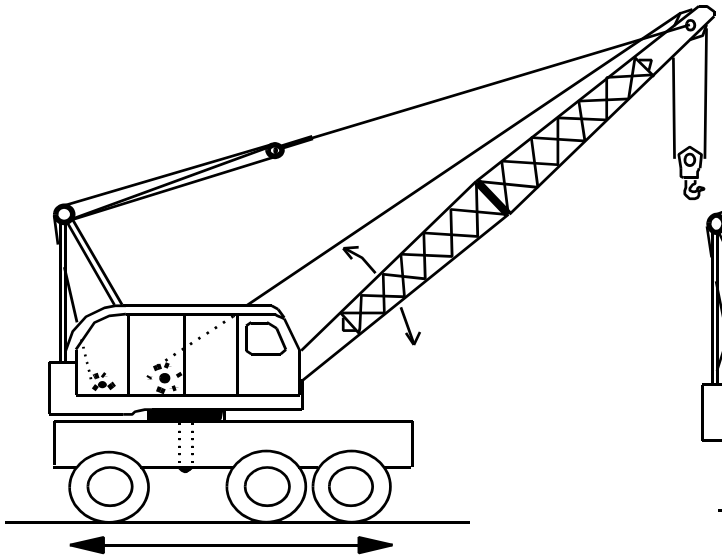


Figure 15-1. Wheel-mounted crane (single control station).

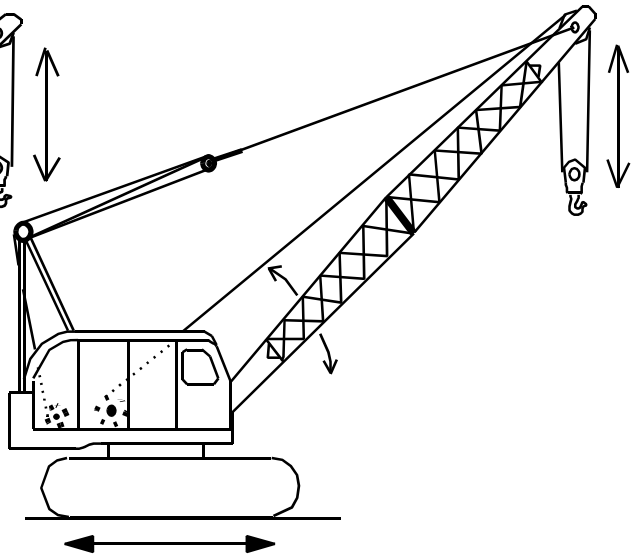


Figure 15-2. Crawler crane

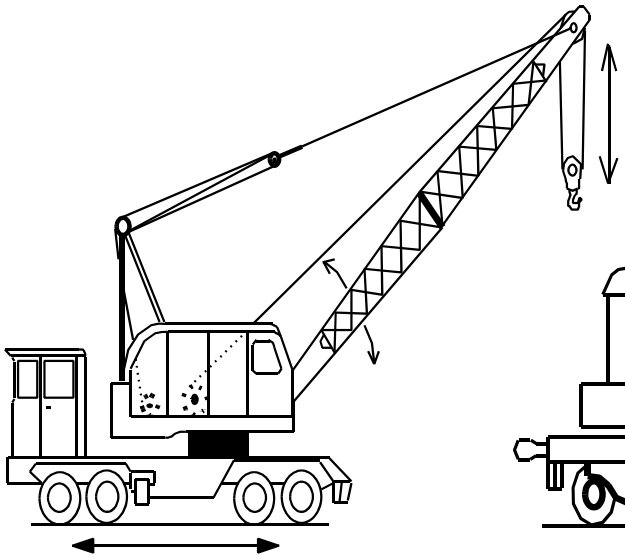


Figure 15-3. Wheel-mounted crane (Multiple control station).

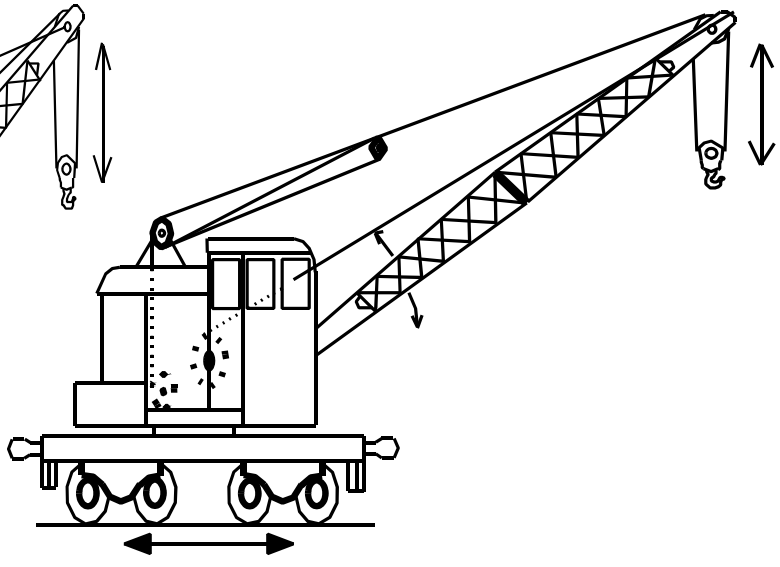


Figure 15-4. Locomotive crane.

General note for Figures 15-5 through 15-10:

The boom may have a base boom structure of sections (upper and lower) between or beyond which additional sections may be added to increase its length, or it may consist of a base boom from which one or more boom extensions are telescoped for additional length. These illustrations show some types.

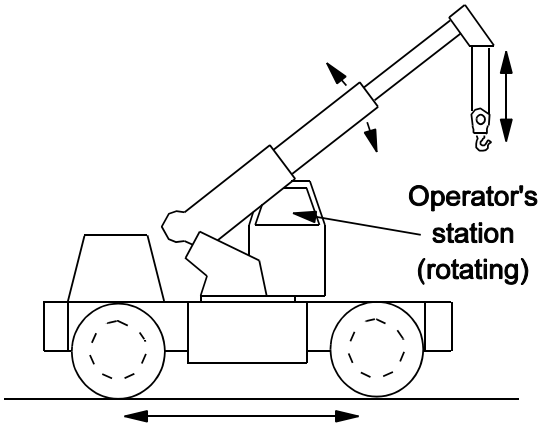


Figure 15-5. Wheel-mounted crane -- telescoping boom (Single control station).

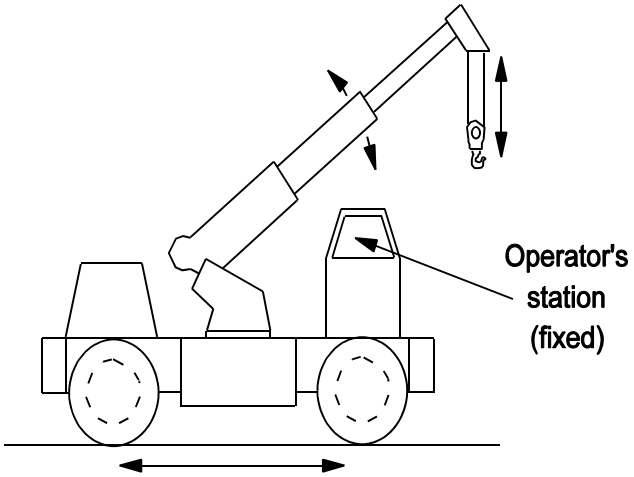


Figure 15-6. Wheel-mounted crane -- telescoping boom (Single control station).

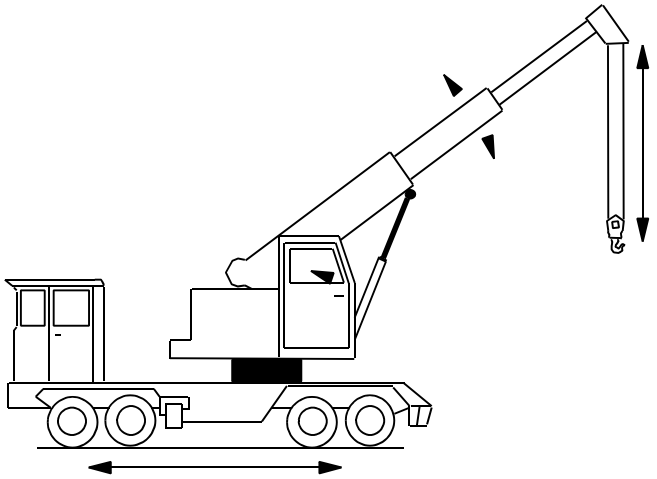


Figure 15-7. Wheel-mounted crane -- telescoping boom (Multiple control station).

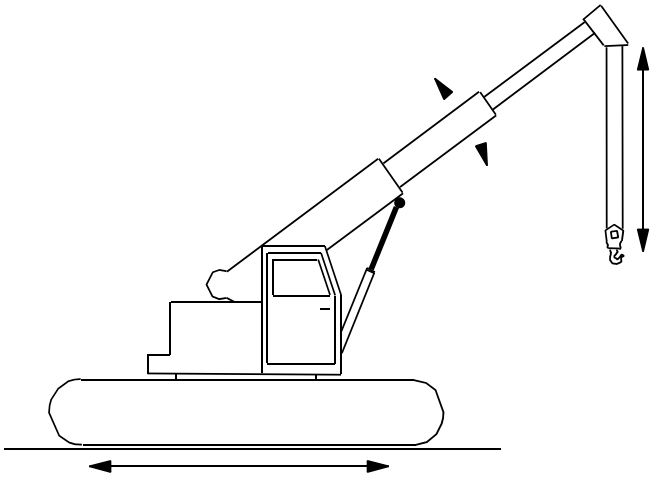


Figure 15-8. Crawler crane -- telescoping boom.

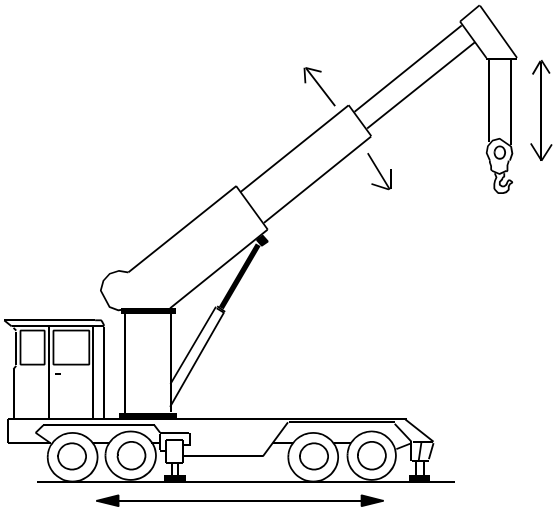


Figure 15-9. Commercial truck-mounted crane -- telescoping boom.

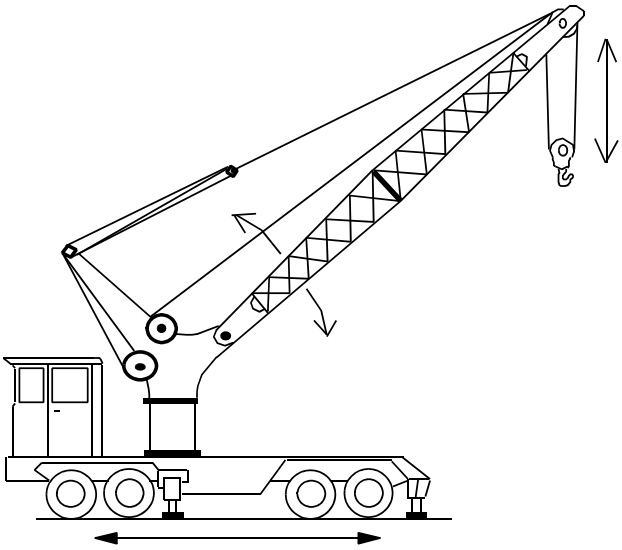


Figure 15-10. Comerical truck-mounted crane -- nontelescoping boom.

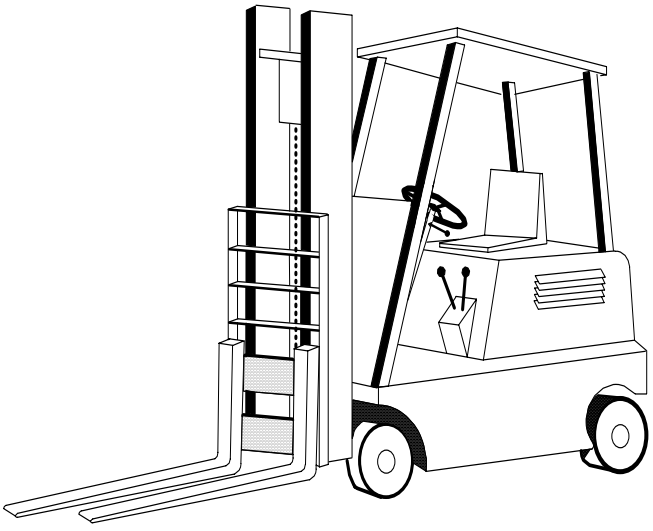


Figure 15-11. High-lift truck, counterbalanced truck, Cantilever truck, rider truck, forklift truck.

QUALIFIED: A person, who, by possession of a recognized degree or certificate, or by professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated an ability and competence to solve problems relating to the subject matter and work.

QUALIFIED ENGINEER/QUALIFIED ENGINEERING ORGANIZATION: An engineer or engineering organization whose competence in evaluation of the type of equipment in question has been demonstrated to the satisfaction of the responsible manager.

QUALIFIED INSPECTOR: One whose competence is recognized by the authority having jurisdiction and whose qualification to perform specific inspection activities has been determined, verified, and attested to in writing.

QUALIFIED OPERATOR: One whose competence to operate equipment safely and effectively (including the ability to accurately spot and control loads) can be demonstrated to and accepted by responsible management.

QUALIFIED RIGGER: One whose competence in this skill has been demonstrated by experience accepted as satisfactory by the responsible manager.

15.3 PERSONNEL QUALIFICATIONS

15.3.1 Qualified Operators of Mobile Cranes

a. Only qualified personnel or trainees, under the direct supervision of qualified personnel, who meet the following physical qualifications and requirements shall be allowed to operate mobile cranes:

1. Be at least 18 years of age.

2. Understand spoken and written English.

3. Have vision of at least 20/30 Snellen in one eye, and 20/50 in the other, with or without corrective lenses.

4. Be able to distinguish colors, regardless of position, if color differentials required for operation.

5. Have adequate hearing, with or without a hearing aid, for a specific operation.

6. Have physical strength, coordination, and sufficient reaction speed to meet the demands of equipment operation.

7. Show no evidence of physical defects or of emotional instability that could be a hazard to themselves or others, or which, in the opinion of the examiner, could interfere with their safe performance; such evidence may be sufficient cause for disqualification. In these cases, medical judgments and test may be required.

8. Show no evidence of being subject to seizures or loss of physical control; such evidence shall be sufficient reason for disqualification. Medical examinations may be required to determine these conditions.

9. Have normal depth perception, field of vision, manual dexterity, coordination, and no tendencies to dizziness or similar potentially hazardous characteristics.

10. Have no detectable or known disease or physical restriction that would render them incapable of safely operating equipment. Where any deficiency of an upper or lower extremity exist, the acceptability of a candidate shall be the decision of the supervisor, after consulting with the designated physician.

11. Shall successfully pass with a negative result, a substance abuse test. The level of testing will be determined by the standard practice for the industry where the crane is employed and this test shall be confirmed by a recognized laboratory service.

12. Operator physical examinations shall be required every three years or more frequently if supervision deems it necessary.

b. Prior to allowing mobile crane operations at DOE installations, the construction manager shall implement a program or ensure that the construction contractor has an acceptable program to evaluate crane operator qualifications. This program shall include written testing to evaluate operator knowledge and performance (“hands-on”) testing to evaluate operator skills. These tests shall include, but not be limited to applicable elements of the following:

1. Pre-use crane inspection.

2. The crane's specifications, operator's manual, charts (e.g., load charts, work area charts), instrumentation, controls, operator aids, and operating characteristics.

3. Operating procedures under emergency conditions.

4. Set-up, shut-down and parking of the crane.

5. Crane attachments (e.g., jibs, boom extensions, heavy lift equipment).

6. Configurations and loading effects on the crane.

7. Standards, rules and regulations (e.g., hand signals, distances for working around electrical power lines).

8. Rigging practices.

9. Personnel lifting procedures.

NOTE: The means of determining operator qualifications shall be included in the contract

documents. Contract documents shall also include requirements for maintenance of testing records. Consideration should be given to local, state, or federal crane operator licensing requirements within the work jurisdiction as well as certification programs administered by recognized private organizations.

15.3.2 Qualified Operators of Forklift Trucks

a. Physical qualifications shall be based on specific job requirements.

b. Operators shall be required by the employer to pass a practical operating skill evaluation. Qualification shall be limited to the type of forklift for which the operator is being evaluated.

c. The actual or simulated operation shall enable operators to demonstrate basic knowledge and skills at a level that ensures the safety of personnel and equipment.

d. Only qualified and authorized operators shall be permitted to operate powered forklift trucks. Operator trainees may operate powered forklift trucks under the direct supervision of a qualified operator or trainer and only where such operations does not endanger the trainee or other employees.

e. The initial training of operators shall include:

1. A combination of formal instruction (e.g., lecture, discussion, interactive computer learning, video tape, written material).

2. Practical training (demonstrations performed by the trainer and practical exercises performed by the trainee).

3. Evaluation of the operator's performance in the workplace including results of written and oral evaluation, and witnessing a demonstration of the operator's skills.

f. The following checklist contains basic factors with which a forklift truck operator should be familiar. This checklist must be tailored to suit actual conditions.

1. Operating instruction, warnings, and precautions for the type of forklift truck the operator will be authorized to operate.

2. Differences between the forklift truck and the automobile.

3. Forklift truck controls and instrumentation:

i. Where they are located.

ii. What they do.

iii. How they work.

4. Engine or motor operation.

5. Steering and maneuvering.

6. Visibility, including restrictions due to loading.

7. Fork and attachment adaptation, operation, and use limitations.

8. Forklift truck capacity and load weight determination.

9. Forklift truck stability and load dynamics.

10. Forklift truck inspections and maintenance that the operator will be required to perform.

11. Refueling and/or charging and recharging of batteries.

12. Operating limitations.

13. Any other operating instructions, warning, or precautions listed in the operator's manual for the type of forklift truck that the employee is being trained to operate.

g. The following checklist contains basic factors with which a forklift operator should be familiar as they relate to workplace topics.

1. Surface conditions where the forklift will be operated.

2. Composition of loads to be carried and load stability.

3. Load manipulation, stacking, and unstacking.

4 .Pedestrian traffic in areas where the forklift will be operated.

5. Narrow aisles and other restricted places where the forklift will be operated.

6. Hazardous (classified) locations where the forklift will be operated.

7. Ramps and other sloped surfaces that could affect the forklift's stability.

8. Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust.

9. Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation.

h. Refresher training in relevant topics shall be provided to the operator when:

1. The operator has been observed to operate the forklift truck in an unsafe manner.

2. The operator has been involved in an accident or near-miss incident.

3. The operator has received an evaluation that reveals that the operator is not operating the forklift truck safely.

4. The operator is assigned to drive a different type of forklift truck.

5. A condition in the workplace changes in a manner that could affect the safe operation of the forklift truck.

15.3.3 Qualified Riggers

Qualified riggers shall meet the following requirements:

a. Be at least 18 years of age.

b. Understand spoken and written English.

c. Have basic knowledge and understanding of equipment-operating characteristics, capabilities, and limitations. Understand rigging principles as applied to the job for which they are to be qualified.

d. Demonstrate to appropriate management personnel skill in using rigging principles.

e. Be free of any detectable or known disease or physical restriction that would render them incapable of safe operation or rigging duties. Where any loss or loss of function of an upper or lower extremity exists, the acceptability of the candidate shall be the decision of the supervisor, after consulting with the designated physician.

f. Have normal depth perception, field of vision, reaction time, manual dexterity, and coordination.

15.3.4 Person-in-Charge (PIC)

The PIC shall have the necessary knowledge and experience of the specific type of equipment and the hazards of critical lifts to direct the safe completion of the operation. The PIC shall understand the rules and procedures implemented at the site to ensure that the following are completed:

a. Necessary administrative requirements.

b. Personnel assignments and responsibilities.

c. Selection of proper equipment/tools.

d. Recognition and control of hazardous or unsafe conditions.

e. Job efficiency and safety.

f. Critical-lift documentation.

In addition, the PIC shall:

a. Direct operations in the case of an accident.

b. Exercise authority to start and stop work activities.

15.3.5 Designated Leader

The designated leader shall have sufficient knowledge and experience to accomplish the following responsibilities:

a. Ensure that the personnel involved have received proper and current training and qualification for the procedure.

b. Ensure that the equipment and accessories specified in the procedure are available.

c. Survey the lift site for hazardous or unsafe conditions.

d. Ensure that equipment is properly set up and positioned.

e. Ensure that a signaler is assigned, if required, and is identified to the operator.

f. Direct the lifting operation to ensure that the job is done safely and efficiently.

g. Stop the job when any potentially unsafe condition is recognized.

h. Direct operations if an accident or injury occurs.

15.3.6 Inspector

a. Qualified inspectors shall have the necessary knowledge and experience to properly inspect hoisting and rigging equipment.

b. Employees who operate hoisting equipment to perform inspections shall be trained and qualified to operate the equipment on which the inspection is being performed. See general and specific qualification requirements in Section 15.3.1 and 15.3.2, *Personnel Qualification*.

c. Hoisting equipment operation by inspectors shall be limited to those equipment functions necessary to perform the inspection on the equipment.

15.3.7 Maintenance Personnel

a. Employees who operate hoisting equipment to perform hoisting equipment maintenance shall be trained and qualified to operate the equipment on which maintenance is being performed. See general and equipment specific qualification requirements in Section 15.3.1 and 15.3.2, *Personnel Qualification*.

b. Hoisting equipment operation by maintenance personnel shall be limited to those equipment functions necessary to perform maintenance on the hoisting equipment or to verify the performance of the hoisting equipment after maintenance has been performed.

15.4 INSPECTION AND TESTING

15.4.1 General

a. Only equipment that has been built to nationally recognized manufacturers' standards shall be used at DOE installations. Existing equipment shall be brought to an acceptable level of compliance as determined by the construction management contractor. In some instances, the requirements of this section exceed those of the references and in such instances the requirements of this section shall prevail.

b. Prior to being used at a DOE installation, mobile cranes/boom trucks/forklift trucks shall be inspected and approved for operation by appropriate construction management contractor personnel or those having overall responsibility for ordinary hoisting operations.

c. Equipment with deficiencies that may affect the safety of the operation shall not be allowed to operate at DOE installations. No repairs, modifications, or additions that affect the capacity or safe operation of the equipment shall be made by the contractor without the manufacturer's written approval. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer. Dated and signed records shall be kept on file.

d. Mobile cranes, boom trucks, and forklifts that have left the control of the construction management contractor and are then returned shall be reinspected prior to making a critical lift.

15.4.2 Mobile Cranes/Boom Trucks—Inspection

15.4.2.1 Initial Inspection

Prior to initially being used, all new, repaired, or modified cranes shall be inspected by a qualified inspector to ensure their compliance with the applicable provisions of this section. Dated and signed inspection reports shall be kept on file and shall be readily available.

15.4.2.2 Preoperational Check

a. Operators or other designated personnel shall visually inspect items such as the following each day or prior to use if the crane has not been in regular service (records are not required):

1. All control mechanisms for maladjustment interfering with proper operation.

2. Crane hooks and latches for deformation, cracks, and wear.

3. Hydraulic systems for proper oil level.

4. Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leakage.

5. Hoist ropes for kinking, crushing, birdcaging, and corrosion.

6. All anti-two-block, two-block warning, and two-block damage prevention systems for proper operation.

b. The operator or other designated person shall examine deficiencies and determine whether they constitute a safety hazard.

15.4.2.3 Monthly Inspection

a. The operator or other designated person shall visually inspect the following items for damage, wear, or other deficiency that might reduce capacity or adversely effect the safety of the crane:

1. Critical items such as brakes and crane hooks.

2. Hoist ropes.

b. Lower the hook block to its lowest position and examine it for any condition that could result in an appreciable loss of strength.

c. Hooks for cracks, deformation, damage from chemicals, latch engagement (if provided), and evidence of heat damage.

d. A hoist rope with any of the conditions noted in the replacement criteria in Section 15.4.2.6 shall be removed from service and replaced.

e. Signed and dated inspection records shall be kept on file and shall be readily available.

f. Before the crane is returned to service, correct deficiencies that could reduce its capacity or adversely effect its safety.

15.4.2.4 Frequent Inspection

a. The operator or other designated person shall visually inspect the crane at daily to monthly intervals (records not required). These inspections shall, in addition to the requirements of Section 15.4.2.2, "Preoperational Inspection," include the following:

1. All control mechanisms for maladjustment, excessive wear, or contamination by lubricants or other foreign matter interfering with proper operation.

2. All safety devices for malfunction.

3. Rope reeving for noncompliance with crane manufacturer's recommendations.

4. Electrical apparatus for malfunctioning, signs of potentially harmful deterioration, and accumulation of dirt or moisture.

5. Tires for recommended inflation pressure.

6. Boom sections for structural integrity.

b. The operator or other designated person shall examine deficiencies and determine whether a more detailed inspection is required.

15.4.2.5 Periodic Inspection

a. Complete inspections of the crane shall be performed by a qualified inspector at 1- to 12-month intervals, depending on its activity, severity of service, and environment.

b. The qualified inspector shall do the following during periodic inspections:

1. Examine deficiencies and determine whether they constitute a hazard.

2. Keep dated and signed inspection records on file and readily available.

c. These inspections, in addition to the requirements of Sections 15.4.2.3, "Monthly Inspection" and 15.4.2.4, "Frequent Inspection," shall include the following:

1. Deformed, cracked, or corroded members in the crane structure and the entire boom.

2. Loose bolts or rivets.

3. Cracked or worn sheaves and drums.

4. Hooks damaged from chemicals, deformation, or cracks, or having more than 15 percent in excess of normal throat opening or more than 10 degrees twist from the plane of the unbent hook. (Dye-penetrant, magnetic-particle, or other suitable crack-detecting inspections should be performed at least once a year.

5. Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices.

6. Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.

7. Load, boom angle, and other indicators over their full ranges for any significant inaccuracies.

8. Gasoline, diesel, electrical, or other power plants for improper performance or noncompliance with safety requirements.

9. Radiators and oil coolers for leakage, improper performance, or blockage of air passages.

10. Excessive wear of chain drive sprockets and excessive chain stretch.

11. Travel steering, braking, and locking devices, for malfunctioning.

12. Excessively worn or damaged tires.

13. Rust on piston rods and control valves when crane has been idle.

14. Inspect hydraulic and pneumatic hose, fittings, and tubing for:

i. Evidence of leakage at the surface of the flexible hose or its junctions with the metal couplings.

ii. Blistering or deformation of the outer covering of the hydraulic or pneumatic hose.

iii. Leakage at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures.

iv. Evidence of excessive abrasion or scrubbing on the outer surface of a hose, rigid tube, or fitting (means shall be taken to eliminate the interface of elements in contact or otherwise protect the components).

15.4.2.5.1 Hydraulic and Pneumatic Pumps

Inspect for:

a. Loose bolts or fasteners.

b. Leaks at joints between sections.

c. Shaft seal leaks.

d. Unusual noises or vibration.

e. Loss of operating speed.

f. Excessive heating of the fluid.

g.. Loss of pressure.

15.4.2.5.2 Hydraulic and Pneumatic Valves

Inspect for:

a. Cracks in valve housing.

b. Improper return of spool to neutral position.

c. Leaks at spools or joints.

d. Sticking spools.

e. Failure of relief valves to attain correct pressure setting (relief valve pressures shall be checked as specified by the manufacturer).

15.4.2.5.3 Hydraulic and Pneumatic Cylinders

Inspect for:

a. Drifting caused by fluid leaking across the position.

b. Rod seal leakage.

c. Leaks at welded joints.

d. Scored, nicked, or dented cylinder rods.

e. Dented case (barrel).

f. Loose or deformed rod eyes or connecting joints.

15.4.2.5.4 Hydraulic Filters

Inspect hydraulic filters for evidence of rubber particles on the filter element that may indicate hose, "O" ring, or other rubber-component deterioration. Metal chips or pieces on the filter may denote failure in pumps, motors, or cylinders. Further checking will be necessary to determine the origin of the problem before corrective action can be taken.

15.4.2.5.5 Wire Ropes

a. A qualified inspector shall inspect all wire ropes at least annually. More frequent intervals shall be as determined by a qualified person and shall be based on such factors as expected rope life as determined by severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. The qualified inspector shall carefully note any deterioration, such as described below, that results in appreciable loss of original strength and determine whether further use of the rope constitutes an acceptable risk. This inspection shall include examination of the entire rope length without detaching it from the drum.

1. Reduction of rope size below nominal diameter, whether due to loss of core support, internal or external corrosion, or wear of outside wires (see Table 15-1).

Table 15-1. Maximum allowable rope reductions.

Rope diameter	Maximum allowable reduction from nominal diameter
Up to 5/16 in. (8 mm)	1/64 in. (0.4 mm)
Over 5/16 in. to 1/2 in. (13 mm)	1/32 in. (0.8 mm)
Over 1/2 in. to 3/4 in. (19 mm)	3/64 in. (1.2 mm)
Over 3/4 in. to 1 1/8 in. (29 mm)	1/16 in. (1.6 mm)
Over 1 1/8 in. to 1 1/2 in. (38 mm)	3/32 in. (2.4 mm)

2. A number of broken outside wires and the distribution or concentration of such broken wires.

3. Worn outside wires.

4. Corroded or broken wires at end connections.

5. Corroded, cracked, bent, worn, or improperly applied end connections.

6. Kinking, crushing, cutting, or unstranding.

b. The qualified inspector shall take care when inspecting running rope where rapid deterioration could occur, such as in the following:

1. Sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.

2. Sections of the rope at or near terminal ends where corroded or broken wires may protrude.

c. The qualified inspector shall take care when inspecting certain ropes such as the following:

1. Rotation-resistant ropes, because of their higher susceptibility to damage. The internal deterioration of rotation-resistant ropes may not be readily observable.

2. Boom hoist ropes, because of the difficulty of inspection and the important nature of these ropes.

d. No precise rules can be given for determining the exact time to replace wire rope because many variables are involved. Safety in this respect depends largely on the use of good judgment by an appointed person in evaluating remaining strength in a used rope, after allowance for deterioration disclosed by inspection. Safety of rope operation depends on this remaining strength.

e. Conditions such as the following shall be sufficient reason for questioning rope safety and considering replacement:

1. In running ropes, six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay.

2. In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.

3. In rotation resistant ropes, two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in thirty rope diameters.

4. One outer wire broken at the point of contact with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure; additional inspection of this section is required.

5. Wear of one-third the original diameter of outside individual wires.

6. Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.

7. Evidence of heat damage from any cause.

8. Reduction from nominal diameter greater than those listed in Table 15-1.

f. All rope that has been idle for a month or more due to shutdown or storage of a crane on which it is installed shall be inspected before it is placed in service. This inspection shall be for all types of deterioration and shall be performed by an appointed person whose approval shall be required before further use of the rope. A written and dated report of the rope condition shall be filed.

g. To establish data as a basis for judging the proper time for replacement, maintain a continuing inspection record covering the points of deterioration listed above.

h. Ensure that replacement rope is the same size, grade, and construction as recommended by the crane manufacturer, unless otherwise recommended by a rope or crane manufacturer due to actual working condition requirements.

i. Never use discarded rope for slings.

15.4.2.5.6 Load Hooks/Load Blocks

Load hooks/load blocks that have been changed-out shall be inspected by a qualified inspector before the crane is returned to service. Inspection records shall be retained throughout the service life of the hook or load block and shall be readily available.

15.4.2.6 Cranes Not in Regular Use

a. A crane that has been idle for 1 month or longer but less than 6 months shall be given an inspection according to requirements of Section 15.4.2.4, "Frequent Inspection," before it is placed in service.

b. A crane that has been idle for more than 6 months shall be given a complete inspection according to the requirements of Section 15.4.2.5, "Periodic Inspection," before it is placed in service.

c. Standby cranes shall be inspected at least semiannually, according to the requirements of Section 15.4.2.5 "Periodic Inspection." Cranes exposed to adverse environments should be inspected more frequently.

15.4.3 Mobile Cranes/Boom Trucks—Testing

a. Prior to their initial use, all cranes in which load-sustaining parts have been modified, replaced, or repaired shall be load-tested by a qualified inspector or under the direction of that inspector. The replacement of rope is excluded from this requirement. However, a functional test of the crane under a normal operating load should be made before the crane is put back in service.

b. Test weights shall not exceed 110 percent of the rated capacity and shall be accurate to within -5 percent, +0 percent of stipulated values.

c. The inspector shall furnish a written report showing test procedures and confirming the adequacy of repairs or alterations. Test reports shall be kept on file and shall be readily available to appointed personnel.

d. The following shall also be tested as applicable during initial testing:

1. Load lifting and lowering mechanisms.

2. Boom lifting and lowering mechanisms.

3. Boom extension and retraction mechanism.

4. Swinging mechanism.

5. Travel mechanism.

6. Safety devices.

NOTE: Load tests shall not be conducted in locations where the lift meets the definition of critical lift given in Section 15.2, "Definitions."

15.4.4 Forklift Trucks—Inspection

a. Prior to initial use, all new, modified, or repaired forklifts shall be inspected by a qualified inspector to ensure compliance with the provisions of this section.

b. A scheduled planned inspection, maintenance, and lubrication program shall be followed; consult the manufacturer's recommendations.

c. Only trained and authorized personnel shall be permitted to inspect, maintain, repair, and adjust forklift trucks; these services shall be preformed in accordance with manufacturer's specifications. Items listed in the following paragraphs shall be regularly inspected.

1. Inspect brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift-overload devices, guards, and safety devices regularly and maintain them in a safe-operating condition.

2. Carefully and regularly inspect all parts of lift and tilt mechanisms and frame members and maintain them in a safe-operating condition.

3. For special trucks or devices that are designed and approved for operation in hazardous areas, ensure that the original, approved safe-operating features are preserved by maintenance.

4. Check fuel systems for leaks and for the condition of the parts. Give special consideration in case of a leak in the fuel system. Take action to prevent use of the truck until the leak has been corrected.

5. Inspect all hydraulic systems and maintain them in conformance with good practice. Check tilt cylinders, valves, and other similar parts to ensure that drift or leakage has not developed to the extent that it would create a hazard.

6. Maintain instruction plates, tags, or decals for capacity, operation, and maintenance in legible condition.

7. Inspect batteries, motors, controllers, limit switches, protective devices, electrical conductors, and connections and maintain them in conformance with good practice. Pay special attention to the condition of electrical insulation.

8. Attachments shall be included in a scheduled maintenance/inspection program. Inspection steps shall be tailored for the attachment. Load-bearing components shall be examined for deformation and load-bearing welds shall be visually examined for cracks. Mechanical or hydraulic components shall be inspected and maintained in accordance with the manufacturer's instructions.

9. Attachments shall be inspected not less than annually and the inspection should be documented.

10. Fork inspection shall be carried out by a qualified inspector with the aim of detecting any damage, failure, deformation, or other condition that might impair safe use. A fork that shows any of the following defects shall be withdrawn from service, and shall not be returned to service until it is satisfactorily repaired by the fork manufacturer or an expert of equal competence. Fork inspection shall include:

i. *Surface Cracks* - A thorough visual examination for cracks and, if considered necessary, non-destructive crack detection, with special attention to the heel and to the welds that attach the mounting components to the fork blank. Inspection for cracks shall include any mounting mechanisms of the fork blank to the fork carrier. Forks shall not be returned to service if surface cracks are detected.

ii. *Fork Tine Inspection* - Examination for straightness of blade and shank, fork angle (upper face of blade to load face of the shank), fork blade and shank wear. Difference in height of fork tips may vary from manufacturer to manufacturer and with tine length. For these reasons, fork tine inspections shall be done in accordance with manufacturers requirements.

iii. *Positioning Lock* - Confirm that the Positioning Lock (when provided), is in good repair and in correct working order. If any fault is found, the fork shall be withdrawn from service until satisfactory repairs are made.

iv. *Fork Hooks Wear* - When fork hooks are provided, the support face of the top hook and the retaining faces of both hooks shall be checked for wear, crushing, and other local deformations.

v. *Fork Marking* - When fork marking is not clearly legible, it shall be renewed. Marking shall be renewed per instructions from the original fork supplier.

15.4.5 Forklift Trucks—Testing

Forklift truck load tests are not routinely required.

a. Load tests shall not be conducted until verification that inspection and maintenance is up to date.

b. Load tests shall be performed after major repair or modification to components that affect the load-carrying ability of the truck.

c. The manufacturer should be consulted if questions arise as to whether a load test is appropriate.

d. Forklift trucks shall be load tested by or under the direction of a qualified person and in accordance with the manufacturer's recommendations.

e. Test weights shall be accurate to within -5 percent, +0 percent of stipulated values.

f. Load-test records shall be maintained and shall be made available for examination by the construction management contractor.

g. A load test shall not be conducted in locations such that the lift meets the definition of critical lift in Section 15.2.

h. A fork that has undergone repair, other than repair or replacement of positioning locks or marking, shall be subject to a load test as described in ASME B56.1, Section 7.25, "Forks," Item 3, which lists loading and method of test for forks; except for the test load, which shall correspond to 250 percent of the rated capacity marked on the fork.

i. Load capacity of an attachment shall be verified by the manufacturer or by a load test at 100 percent of rated capacity that is performed onsite. Load tests are not routinely required since a catalog cut, user's manual, decals on attachment, or other manufacturer's data serves as capacity verification.

15.4.6 Slings—Inspection

15.4.6.1 Wire Rope

a. Users or other designated personnel shall visually inspect all wire-rope slings each day prior to use, carefully noting any deterioration that could result in an appreciable loss of original strength and determining whether further use of the sling would constitute a safety hazard.

b. Slings shall be immediately removed from service if any of the following conditions are present:

1. Ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay.

2. Wear or scraping of one-third the original diameter of outside individual wires.

3. Kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.

4. Evidence of heat damage from any cause.

5. End attachments that are cracked, deformed, or worn.

6. Hooks that have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

7. Corrosion of the rope or end attachments.

15.4.6.2 Synthetic Web Slings

a. Users or other designated personnel shall visually inspect all synthetic-web slings each day prior to use, carefully noting any deterioration that could result in an appreciable loss of original strength and determining whether further use of the sling would constitute a safety hazard.

CAUTION: Tiedown and/or ratchet straps shallnot be used as synthetic-web slings. Only synthetic-web slings constructed from webbing approved for sling construction by the manufacturer or other qualified person shall be used at DOE locations.

b. A synthetic-web sling shall be removed from service if any of the following defects are visible:

1. Acid or caustic burns.

2. Melting or charring of any part of the surface.

3. Snags, punctures, tears, or cuts.

4. Broken or worn stitches.

5. Wear or elongation exceeding the amount recommended by manufacturers.

6. Distortion of fittings.

7. Knots in any part.

8. Missing or illegible sling identification.

c. For other apparent defects that cause doubt as to the strength of the sling, refer to the manufacturer for determination of whether continued use would constitute a safety hazard.

15.4.6.3 Alloy Steel Chain

a. Users or other designated personnel shall visually inspect all steel-chain slings each day before they are used as follows:

1. Conduct a link-by-link inspection for the following defects: bent or stretched links, cracks in any section of link, scores, or abrasions tending to weaken the rings or hooks. Reject if discovered.

2. Check rings and hooks for distortion, cracks in weld areas, corrosion, scores, or abrasions tending to weaken the ring or hooks. Reject if discovered.

3. Perform inspection on an individual-link basis. If any link does not hinge freely with the adjoining link, remove the assembly from service.

b. Remove from service assemblies with deformed master links or coupling links.

c. Remove from service assemblies if hooks have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

d. Do not straighten deformed hooks or other attachments on the job. Assemblies with such defects shall be reconditioned by the manufacturer.

e. Remove from service assemblies with cracked hooks or other end attachments; assemblies with repairable defects shall be reconditioned or repaired prior to being returned to service.

f. If wear exceeds the values shown in Table 15-2, remove the assembly from service.

Table 15-2. Maximum allowable wear at any point of link.

Chain size (in.)	Maximum allowable wear (in.)
1/4	3/64
3/8	5/64
½	7/64
5/8	9/64
3/4	10/64
7/8	11/64
1	12/64
1-1/4	16/64

NOTE: For other sizes, consult chain or sling manufacturer.

15.4.6.4 Synthetic Round Slings

a. Users of synthetic roundslings shall visually inspect all slings before each use.

b. Annual inspection shall be made by a qualified inspector, and inspection records shall be kept on file and readily available.

c. When it is necessary to use a polyester or nylon roundsling in a radiation area, the responsible manager shall ensure that radiation exposure does not exceed 100,000 rad during the life of the sling.

d. Slings shall be removed from service if any of the following defects are visible:

1. Acid or caustic burns.

2. Melting or charring of any part of the surface.

3. Snags, punctures, tears, cuts, or abrasive wear that expose the core yarns.

4. Broken or worn stitches in the cover which exposes the core yarns.

5. Wear or elongation exceeding the amount recommended by the manufacturer.

6. Stretched, cracked, worn, pitted or distortion of fittings.

7. Knots in any part.

8. Missing or illegible sling identification.

15.4.7 Slings—Testing

15.4.7.1 Wire Rope

a. Wire-rope slings used for critical-lift service shall have an initial proof load test. If proof testing cannot be verified, the wire-rope sling(s) shall be proof tested before being used to make a critical lift. As a minimum, the proof load shall be equal to the rated capacity but shall not exceed:

1. All swaged socket and poured socket sling assemblies shall be proof-tested to the wire rope or fitting manufacturers recommendations but in no case greater than 50 percent of the component wire ropes' or structural strands' nominal strength.

2. 125 percent of the vertical rated capacity of single-leg, hand-tucked slings.

3. 200 percent of the vertical rated capacity for mechanical-spliced single-leg slings and endless slings.

4. The proof- load for multiple-leg bridle slings shall be applied to the individual legs and shall be either 200 percent for mechanical splice or 125 percent for hand-tucked splice, times the vertical rated capacity of a single-leg sling.

5. Master links to which multiple-leg slings are connected shall be proof-loaded to 200 percent times the force applied by the combined legs.

15.4.7.2 Alloy-Steel Chain

a. Single-leg and endless alloy-steel chain slings used for critical-lift service shall have an initial proof load test of 200 percent of the

vertical rated capacity. If proof testing cannot be verified, the sling(s) shall be proof tested before being used to make a critical lift.

b. The proof load for multiple-leg bridle slings shall be applied to the individual legs and shall be 200 percent of the vertical rated capacity of a single-leg sling.

c. Master links to which multiple-leg slings are connected shall be proof-loaded to 200 percent multiplied by the force applied by the combined legs.

15.4.7.3 Synthetic Web Slings

a. Synthetic-web slings used for critical-lift service shall have an initial proof load test of 200 percent of the vertical rated capacity. If proof testing cannot be verified, the sling(s) shall be proof tested before being used to make a critical lift.

b. The proof load for multiple-leg bridle slings shall be applied to the individual legs and shall be 200 percent of the vertical rated capacity of a single-leg sling.

c. Master links to which multiple-leg slings are connected shall be proof-loaded to 200 percent multiplied by the force applied by the combined legs.

15.4.7.4 Synthetic Round Slings

a. Synthetic roundslings used for critical-lift service shall have an initial proof load test of 200 percent of the vertical rated capacity. If proof testing cannot be verified, the sling(s) shall be proof tested before being used to make a critical lift.

b. The proof load for multiple-leg Synthetic roundslings shall be applied to the individual legs and shall be 200 percent of the vertical rated capacity of a single-leg sling.

c. Master links to which multiple-leg slings are connected shall be proof-loaded to 200 percent multiplied by the force applied by the combined legs.

15.4.8 Rigging Accessories—Inspection

a. Users or other designated personnel shall inspect rigging accessories (shackles, swivel hoist rings, eyebolts, turnbuckles, links, rigging assemblies) and hooks at the beginning of each shift in which they are to be used, for the following:

1. Wear.

2. Corrosion.

3. Cracks.

4. Nicks and gouges.

5. Distortion such as bending or twisting.

6. Evidence of heat damage from any cause.

b. The operator or designated person shall carefully examine any deficiencies and determine whether they constitute a hazard. Deficiencies noted during the inspection shall be corrected before the lifting device is used.

c. Hooks having any of the following deficiencies shall be removed from service until repaired or replaced:

1. Cracks.

2. Wear exceeding 10 percent of the original dimension.

3. A bend or twist exceeding 10 degrees from the plane of the unbent hook.

4. Increase in throat opening exceeding 15 percent from the new condition.

5. If a latch is provided and it becomes inoperative because of wear or deformation or fails to fully bridge the throat opening, remove the hook from service until the latch has been repaired or replaced.

NOTE: If hooks are painted, a visual inspection should take the coating into consideration. Surface variations can disclose evidence of heavy or severe service. In such instances, the surface condition may call for stripping the paint.

15.4.9 Rigging Accessories—Testing

a. Rigging accessories for critical-lift service shall have an initial proof-load test of 2 times the rated capacity. The rigging accessories shall be proof-tested prior to making a critical lift if proof-testing cannot be verified.

b. Rigging accessories that have been modified or repaired shall be proof-tested again to 2 times the rated capacity prior to making a critical lift.

c. Multileg lift assemblies shall be proof-tested based on any two legs sharing the entire load. Attach legs not undergoing test in a manner to ensure that load stability is not lost during the test.

d. Dynamometers and load cells shall be calibrated at least once a year and when specified in the critical lift procedure before being used to make a critical lift. This also applies if they have not been used in the previous 6 months. All calibrated devices shall have a tag affixed indicating date of calibration, by whom they were calibrated, and the date that the next calibration is due.

15.4.10 Below-the-Hook Lifting Devices—Inspection

a. The operator or other designated person shall visually inspect each lifting device at the beginning of each shift or prior to use, if it has not been in regular service, for the following items or conditions (records are not required):

1. Structural deformation, cracks, or excessive wear on any part.

2. Loose or missing guards, fasteners, covers, stops, or nameplates.

3. All operating mechanisms and automatic hold-and-release mechanisms for misadjustment interfering with operation.

4. Loose bolts or fasteners.

5. Cracked or worn gears, pulleys, sheaves, sprockets, bearings, chains, and belts.

6. Excessive wear of friction pads, linkages, and other mechanical parts.

7. Excessive wear at hoist-attaching points and load-support shackles or pins.

b. The operator or designated person shall carefully examine any deficiencies and determine whether they constitute a hazard. Deficiencies noted during the inspection shall be corrected before the lifting device is used.

15.4.11 Below-the-Hook Lifting Devices—Testing

a. Below-the-hook lifting devices for critical-lift service shall be proof-load tested. The rated capacity shall not be more than 80 percent of the maximum load sustained during the test. Test loads shall not be more than 125 percent of the rated capacity unless otherwise recommended by the manufacturer.

b. The lifting device shall be proof-tested prior to making a critical lift if proof-testing cannot be verified.

c. Lifting devices that have been modified or repaired shall be proof-tested in accordance with paragraph a., prior to making a critical lift.

15.5 OPERATION

15.5.1 General

The following shall apply to all personnel involved in construction hoisting and rigging operations.

a. An appointed person shall classify each lift into one of the DOE categories (ordinary or critical), prior to planning the lift.

b. A lift shall be designated as a critical lift if the requirements for ordinary lifts do not adequately eliminate or control the likelihood or severity of the following:

1. Damage that would result in delay to schedule or other significant program impact such as loss of vital data.

2. Significant release of radioactive or other hazardous material or other undesirable conditions.

3. Personnel injury or significant adverse health impact (onsite or offsite).

4. Undetectable damage that would jeopardize future operations or the safety of a facility.

c. A lift should also be designated as critical if the load requires exceptional care in handling because of size, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors.

15.5.2 Conduct of Operator

a. Ensure proper functioning of tires, horns, lights, batteries, controllers, lift systems (including load-engaging means, limit switches, etc.), brakes, and steering mechanisms. If at any time a lifting device is found to be defective or in any way unsafe, report it immediately to appropriate management and take the unit out of service until it has been restored to safe-operating condition or a determination has been made by the construction management contractor that the deficiency will not adversely affect the operation of the unit.

b. The safety of personnel and equipment is the first priority. Report or correct any unsafe condition immediately.

c. If the operator's visibility is impaired by dust, darkness, snow, fog, or rain, strict supervision of the operation must be exercised, and if necessary, the equipment shall be withdrawn from service.

d. Be alert while operating and always keep your eye on the load. If your attention must be directed elsewhere, discontinue operation first. Keep a signaler in full view if you cannot see the load at all times.

e. Never operate the machine or allow anyone to operate it unless that person is thoroughly familiar with the machine, its operation, and proper care.

f. Be a good housekeeper. Keep the work area free of oil, grease, rags, buckets, barrels, and other hazards. Keep loose parts in a tool box. Use only nonflammable solutions for cleaning. Be sure shoe soles are clean and dry before operating brakes.

g. Replace all missing or broken guards and panels.

h. Never tamper with safety devices.

i. Have a fire extinguisher on hand and know how to use it. Be sure that it is checked regularly (at least monthly) to ensure it is in proper working order.

j. Check the motion controls for proper functioning at the start of each shift or prior to use if the crane has not been in regular service.

k. Make certain that no one is working on or close to the machine before starting the engine or beginning to move. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

l. Use caution when refueling. Stop the engine; do not permit smoking within 25 ft; never refuel near an open flame. Keep metal funnels in contact with the filler tube to prevent static spark. Turn off the heater before fueling.

m. Use both hands to mount and dismount. Never get on or off a moving machine, and never jump off, even if the machine is stationary.

n. Hand signals from only one person shall be obeyed. However, *obey a STOP signal*

regardless of who gives it. Use the standard signals shown in Figure 15-12.

o. Many machines have ratings limited by factors other than machine stability. Never exceed the rated capacity.

p. Make a dry run in confined areas to help determine the safest way to operate under existing conditions.

q. Check loads before moving them. First, determine the load weight and check it against the capacity chart. Be sure the load is well secured and the hoist ropes are not kinked. Ensure that the hoist ropes are vertical and avoid sudden starts and stops.

15.5.3 Mobile Cranes/Boom Trucks

a. Never use signs of tipping to determine if a load is within a crane's capacity. Operating by the "seat of the pants" is an unacceptable practice.

b. Know the rated capacity of the crane. A safe lift depends on boom length, boom angle, and working radius. Follow these suggestions to avoid structural failure or tipping:

1. Know the radius of the load. Remember that the radius is measured from center of rotation, not from the boom foot pins.

2. Always operate within the rated capacity of the machine.

3. Subtract the weight of hooks, blocks, and any other material-handling devices (slings, shackles, spreader bars, etc.) from the gross capacity of the crane to determine if the load can be lifted safely.

4. Load chart ratings are based on operating the machine on firm, level ground. Outriggers shall be fully extended and lowered so that all wheels are clear of the ground, unless otherwise specified on the manufacturer load charts for the crane. Otherwise, "on rubber" load charts shall be used.

5. Avoid rapid changes in velocity while hoisting, swinging, or lowering the load; these can cause overloads when operating at or near the crane's capacity.

6. Do not lift large, heavy loads in strong winds. Wind loading can be critical depending on boom length, boom angle, bulkiness of the load, wind direction, and wind velocity.

7. In the absence of crane manufacturer's instructions regarding maximum wind speeds for operation, operations undertaken at wind speed in excess of 25 mph should be evaluated by a qualified person to determine if the size, shape and weight of the load can be safely lifted.

c. Always use the shortest boom possible, and observe these precautions with any boom length:

1. Make only vertical lifts. Never pull the load sideways.

2. Keep speed slow in lifting, lowering, and stopping loads.

3. Do not let the load strike the boom or outriggers and never allow a crane boom to hit or touch any structure. (Boom contact could dent or bend the lower boom chords and may cause a total boom collapse.) Boom contact with any object shall require an engineering evaluation prior to putting the crane back in service. Damage to the crane sustained during operation shall be repaired according to manufacturer's specifications using certified welders. A reinspection or load test is required after repairs are complete, as is a recertification by the construction management contractor at the subcontractor's expense indicating that the unit can return to service.

4. Allow maximum clearance between the hook block and boom point sheaves.

5. Keep near-capacity loads as close to the ground as possible.

d. Cranes shall not be operated without the ballast or counterweight being in place as specified by the crane manufacturer. Under specific conditions, such as during crane assembly, unusual boom configurations, etc. the crane manufacturer's recommendations for the amount of ballast or counterweight shall be adhered to. Ballast or counterweight as specified by the manufacturer shall not be exceeded.

e. Rotate the crane slowly to avoid an outward swing of the load.

f. Keep the boom high enough to swing clear of the cab when rotating the crane on truck-mounted units.

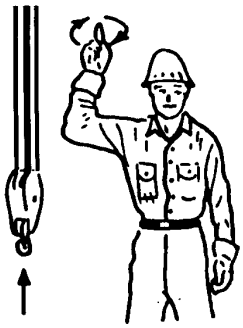
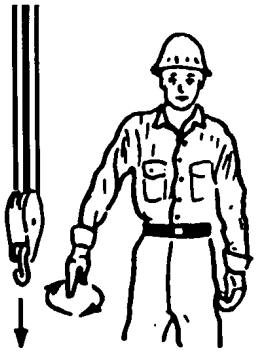
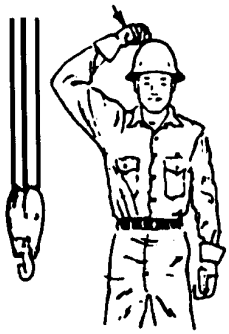
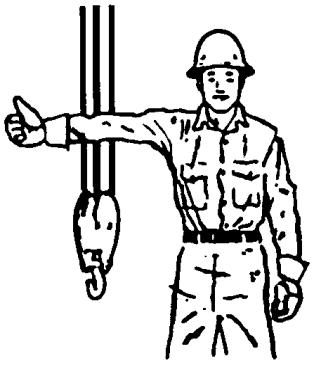
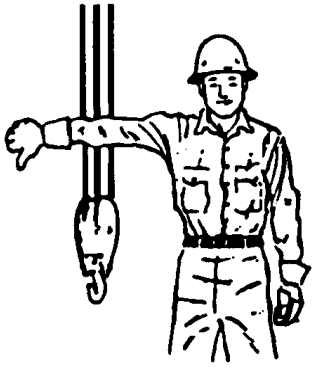
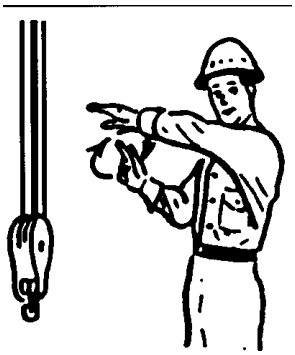
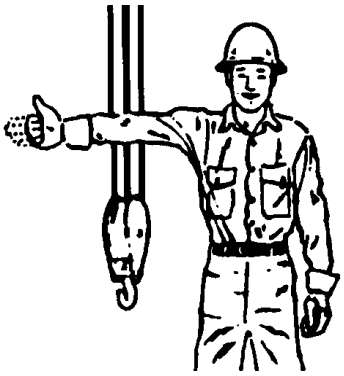
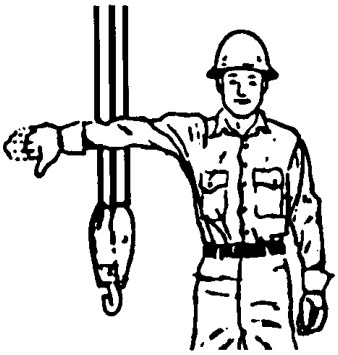
 HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circles.	 LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.	 USE MAIN HOIST. Tap fist on head, then use regular signals.
 USE WHIPLINE (Auxiliary Hoist). Tap elbow with one hand, then use regular signals.	 RAISE BOOM. Extend arm, fingers closed, thumb pointing upward.	 LOWER BOOM. Extend arm, fingers closed, thumb pointing downward.
 MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless above hand giving the motion signal. (Hoist slowly shown as example.)	 RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	 LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

Figure 15-12. Standard hand signals for controlling crane operation.

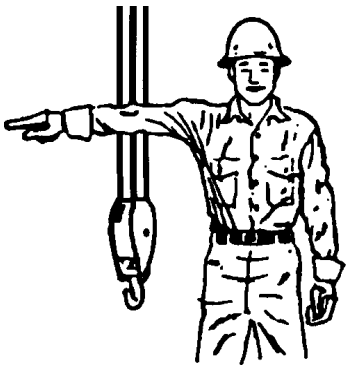
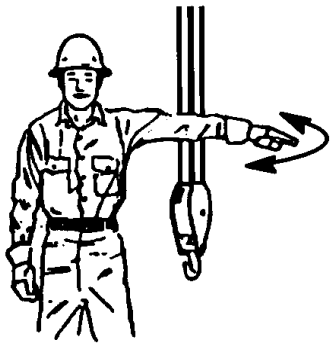
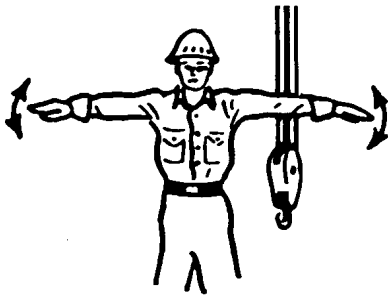
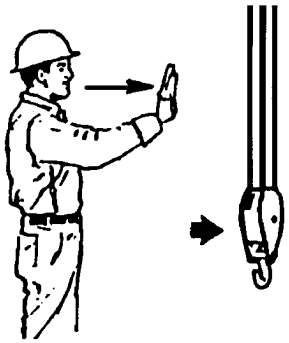
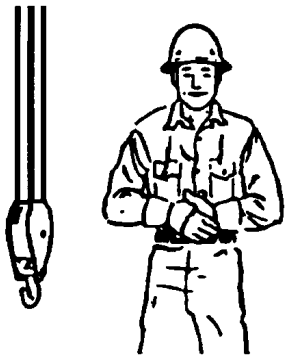
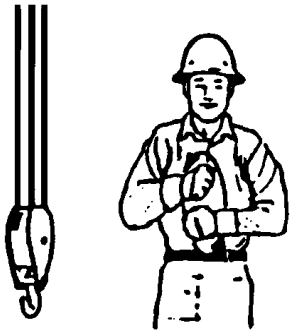
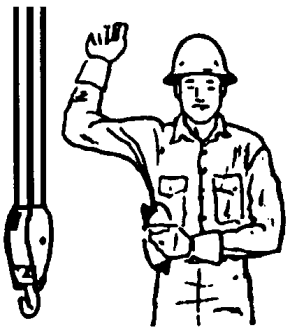
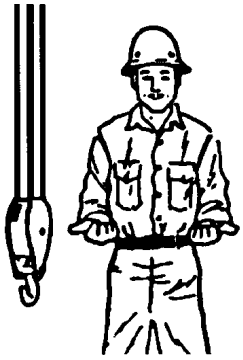
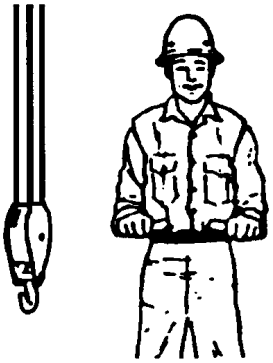
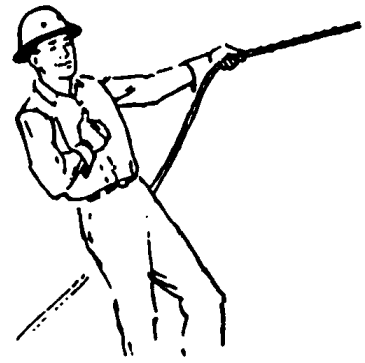
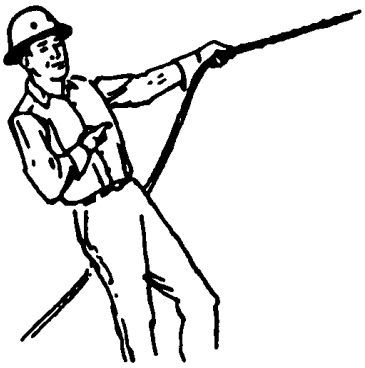
 SWING. Extend arm, point with finger in direction of swing of boom.	 STOP. Extend arm, palm down; move arm back and forth horizontally.	 EMERGENCY STOP. Extend both arms, palms down, and move arms back and forth horizontally.
 TRAVEL. Extend arm forward, hand open and slightly raised; make pushing motion in direction of travel.	 DOG EVERYTHING. Clasp hands in front of body.	 TRAVEL (Both Tracks). Use both fists in front of body, making a circular motion about each other, indicating direction of travel, forward or backward (for land cranes only).
 TRAVEL (One Side Track). Lock the track on side indicated by raised fist. Travel opposite track indicated by circular motion of other fist, rotated vertically in front of body (for land cranes only).	 EXTEND BOOM (Telescoping Booms). Hold both fists in front of body, thumbs pointing outward.	 RETRACT BOOM (Telescoping Booms). Hold both fists in front of body, thumbs pointing toward each other.

Figure 15-12. (continued).



EXTEND BOOM (Telescoping Boom). One-hand signal. One fist in front of chest with thumb tapping chest.



RETRACT BOOM (Telescoping Boom). One-hand signal. One fist in front of chest with thumb pointing outward and heel of fist tapping chest.

Figure 15-12. (continued).

g. Watch for boom kickback. Never operate with the boom at a higher angle than shown on the capacity chart.

h. Avoid "two-blocking," which is caused when the hook block collides with boom-point sheaves. Continuous pull on hoist ropes can break the ropes or might pull the boom over the cab. On hydraulically telescoping booms, be sure to play out the hoist rope when extending and reel in the hoist rope when retracting.

i. On truck-mounted cranes, no loads shall be lifted over the front area, except as approved by the crane manufacturer.

15.5.3.1 Attaching the Load

a. Ensure that the hoist rope is free of kinks or twists and is not wrapped around the load.

b. Attach the load to the load-block hook with slings or other approved devices.

c. Make certain that the sling clears all obstacles.

d. Do not hoist two or more separately rigged loads in one lift, even though the combined load is within the crane's rated capacity.

15.5.3.2 Moving the Load

a. Before moving the load, make certain that it is well secured and properly balanced in the sling or lifting device before lifting it more than a few inches.

b. Before starting to hoist, note the following conditions:

1. Multiple-part lines shall not be twisted around each other.

2. The hook shall be positioned over the load in such a manner as to prevent swinging when the load is lifted.

3. If there is a slack-rope condition, determine that the rope is properly seated on the drum and is in the sheaves.

c. Test stability before lifting heavy loads. Check outrigger footing. Lift load slightly off the ground and stop. Check the machine for movement and check to be sure the brakes are holding. Never use machine stability to determine capacity. If there are any indications of tipping, the machine is already overloaded for that working radius.

d. Do not use cranes for side pulls except when specifically authorized by a designated person who has determined that the stability of the crane is not endangered and that the parts of the crane will not be over stressed.

e. Do not hoist, lower, or travel while anyone is on the load or hook, except as noted in Section 15.6, "Lifting Personnel."

f. Do not move loads above people.

g. Test the brakes each time a load approaching the rated capacity is handled by raising the load a few inches and applying the brakes.

h. Power down when lowering loads. When lowering heavy loads, keep the hoist brakes as reserve. Use a safety pawl on the boom-hoist drum when not lowering.

i. Do not lower the load below the point where less than two full wraps of rope remain on the hoist drum.

j. Do not leave your position at the controls while the load is suspended unless required to do so by an approved emergency procedure.

k. Work on suspended loads is prohibited under normal conditions. When the responsible manager decides that is necessary to work on suspended load, guidelines for ensuring safety of the work shall be established through consultation with the appropriate safety organization. Suspended loads that must be worked on shall be secured against unwanted movement.

l. Tag lines should be used as required to guide, snub or otherwise control the load.

15.5.3.3 Traveling the Machine

a. Secure the boom and hook block.

b. Check bridges before crossing; make sure they will support the weight of the machine.

c. Check river depths before fording.

d. Check clearances under overpasses, overhead lines, or any overhead obstruction. When side clearances are tight, post a lookout and be sure there is clearance for tail swing.

e. When traveling with a load, snub the load to prevent swaying if possible. Never travel with near-capacity loads.

f. Never travel a rubber-tired unit with a load over the side.

g. On soft surfaces, always move with the load behind; this helps to raise the leading end of the tracks and makes traveling safer.

h. Always set swing brakes when the unit is idle or holding loads for a period of time, especially on slopes. If swinging during travel is necessary, engage the swing-jaw clutch before releasing brakes.

i. Never back up until everyone is clear of the machine, and use a signaler when backup alarms are not provided.

j. Avoid tipping by never backing the crane while carrying a maximum load.

k. For long moves, position the boom in the direction of travel.

l. Block treads when moving uphill to prevent downhill movement before shifting steering clutches.

m. Lock the turntable prior to highway travel. Use a house lock or swing brake, and lower boom into the rack to prevent swing.

n. When loading machine on the trailer, always use a ramp; if a ramp is not available, use blocking to build one.

o. Be familiar with the equipment and its proper care. If adjustments or repairs are necessary, promptly report this to the appropriate level of management.

p. Test all controls at the start of a new shift. If any controls fail to operate properly, adjust or repair them before operations are begun.

q. Block under the boom before disassembling. Never stand on or under the boom during this work.

r. Before disconnecting oil lines, if machine has hydraulic controls, be sure to place the boom on the ground or in the boom rest, then move the pedals and control levers to equalize pressures within the cylinders. Always release any air supercharge on the hydraulic reservoir and shut off the engine (or declutch pumps) before disconnecting oil lines.

s. Do not reach into hydraulic-boom holes unless the sections are securely anchored together.

15.5.3.4 Operating Near Power Lines and Transmission Towers

It is recognized that operating mobile cranes where they can become electrified from electric power lines is an extremely hazardous practice. It is advisable to perform the work so there is no possibility of the crane, load line, or load becoming a conductive path, (Figure 15-13). The following steps shall be taken to minimize the hazard of electrocution or serious injury as a result of contact between the energized power lines and the crane, load line, or load:

a. The (electric) Power Marketing Administrations in DOE may deviate from the requirements of Table 15-3, providing the work is done according to line management-approved procedures that do not conflict with statutory regulations or approved variances from these regulations.

b. Any overhead wire shall be considered to be an energized line unless and until the person owning the line or the electrical utility authorities indicate that it is not an energized line.

c. Durable signs shall be installed at the operator's station and on the outside of the crane, warning that electrocution or serious bodily injury may occur unless a minimum clearance of 10 ft (3.1 m) is maintained between the crane or the load being handled and energized power lines. Greater clearances are required because of higher voltage as stated in Table 15-3. These signs shall be revised but not removed when a local jurisdiction requires greater clearances.

d. Exercise caution when working near overhead lines having long spans as they tend to move laterally or vertically due to the wind, which could cause them to breach the safety zone.

e.. Cranes shall not be used to handle materials stored under electric power lines unless any combination of the boom, load, load line, or machine component cannot enter the prohibited zone.

f. Crane operators shall not rely on the coverings of wires for their protection.

15.5.3.4.1 Crane Operation Near De-energized and Grounded Electric Power Lines

This is the preferred condition under which the operation can be performed safely. The hazard of injury or death due to electrocution has been remove. The following steps shall be taken to assure de-energization of the power lines has occurred:

a. The power company or owner of the power lines shall de-energize the lines.

b. The lines shall be visibly grounded to avoid electrical feedback and appropriately marked at the job-site location.

c. A qualified representative of the owner of the lines or a designated representative of the electrical utility shall be on site to verify that steps (a) and (b) have been completed and that the lines are not energized.

15.5.3.4.2 Power Lines Energized, Crane Operating Less than Erected/Fully Extended Boom Length away from the Prohibited Zone (see Figure 15-14)

a. An on-site meeting between project management and a qualified representative of the owner of the lines or a designated representative of the electrical utility shall take place to establish the procedures to safely complete the operations.

b. The specified clearance between the power lines and the crane, load line, and load shall be maintained at all times as specified in Table 15-3.

c. Load control, when required, shall utilize tag lines of a non-conductive type.
signaler indicates it is safe to do so.

d. Operation of boom and load over electric power lines is extremely dangerous, due to perception of distance and multiple contact points as viewed from the position of the crane operator and/or position of the designated signaler. The operator should avoid operating the crane, with or without a load, in this area.

e. A designated signaler, whose sole responsibility is to verify that the required clearance is maintained shall be in constant contact with the crane operator.

f. No one shall be permitted to touch the crane or the load unless the designated to perception of distance and multiple contact points as viewed from the position of the operator and /or position of the designated signaler. The operator should avoid operating the crane, with or without a load, in this area.

g. The horizontal and vertical distance of movement of long span lines due to the wind shall be added to the minimum clearance distance as specified in Table 15-3. A qualified representative of the owner of the lines or a designated representative of the electrical utility shall be consulted for specific distances.

h. Devices such as ribbons, balls, etc., should be attached by a qualified person to the power lines to improve visibility, or equivalent means employed to aid in location of the prohibited zone.

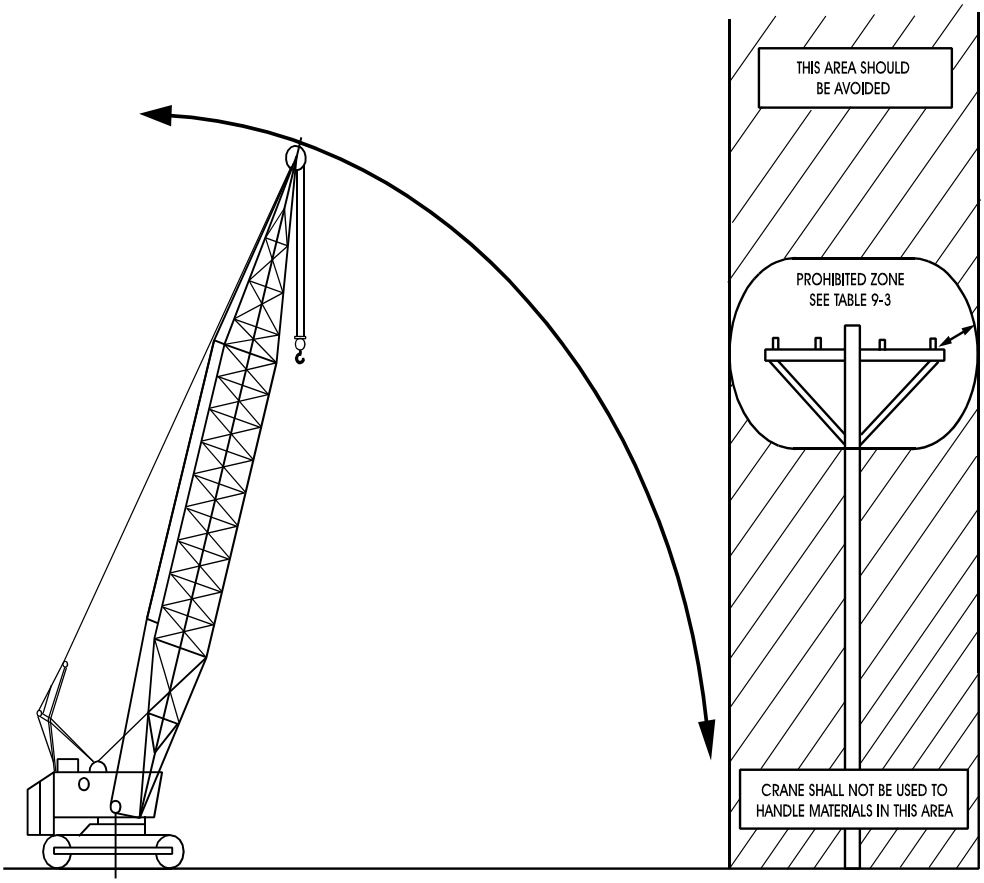


Figure 15-13. Danger zone for cranes and lifted loads operating near electrical transmission line

Table 15-3. Safe working distance from power lines.

a. When operating near high-voltage power lines:				
Normal voltage (phase to phase)				Minimum required clearance
		to	50 kV	10 ft (3.1 m)
Over	50	to	200 kV	15 ft (4.6 m)
Over	200	to	350 kV	20 ft (6.1 m)
Over	350	to	500 kV	25 ft (7.6 m)
Over	500	to	750 kV	35 ft (10.7 m)
Over	750	to	1000 kV	45 ft (13.7 m)

b. While in transit with no load and boom or mast lowered:				
Normal voltage (phase to phase)				Minimum required clearance
		to	0.75 kV	4 ft (1.2 m)
Over	0.75	to	50 kV	6 ft (1.3 m)
Over	50	to	345 kV	10 ft (3.5 m)
Over	345	to	700 kV	16 ft (4.9 m)
Over	750	to	1000 kV	20 ft (6.1 m)

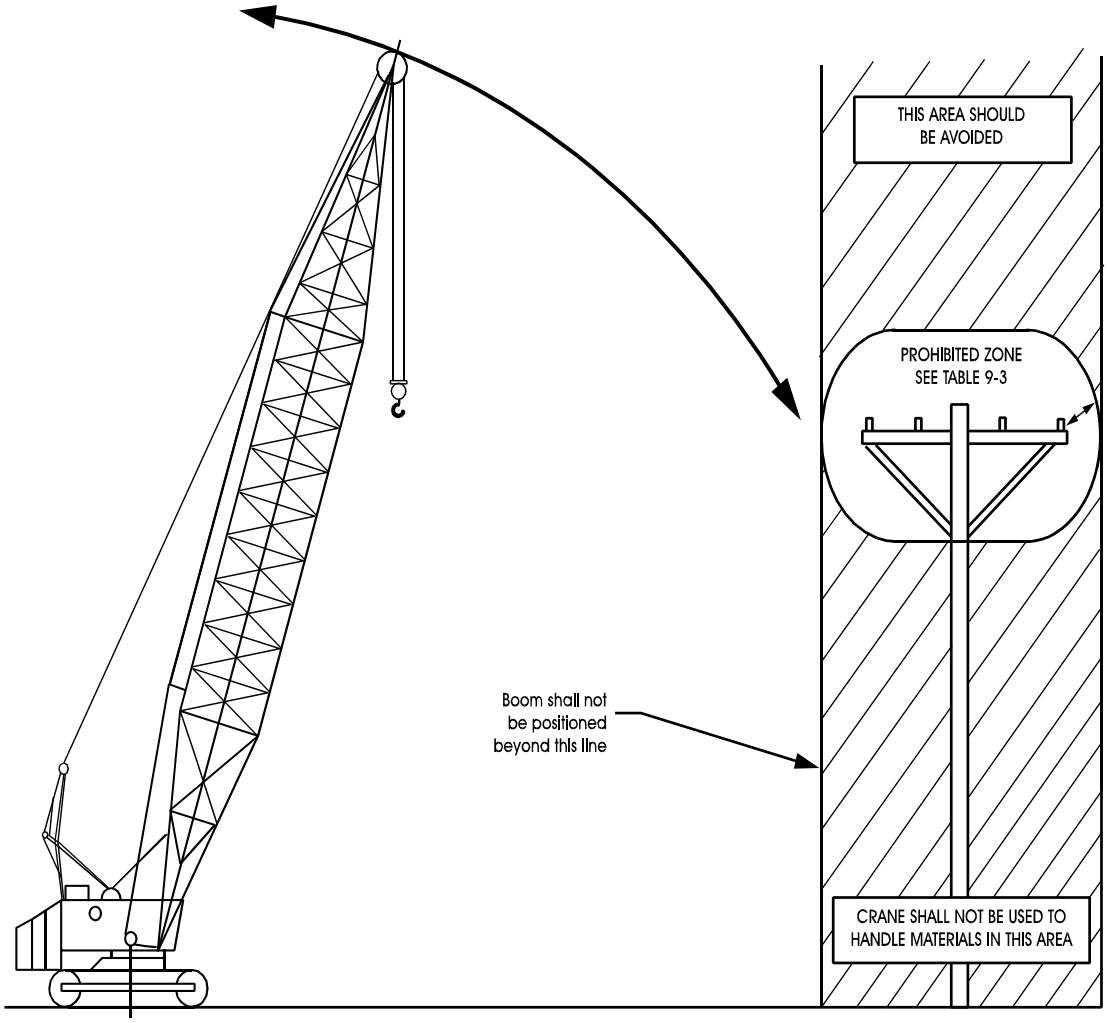


Figure 15-14. Danger zone for cranes and lifted loads operating near electrical transmission line.

15.5.3.4.3 Crane Operations are Within the Prohibited Zone and the Power Lines are Energized

a. Before such operations take place, a qualified person together with a qualified representative of the utility or an engineer qualified in power line transmission shall, after visiting the site, determine if this is the most feasible way to complete the operation, and set minimum required clearances and procedures for safe operations. These operations shall be under their supervision.

The following guidelines should be required:

1. Crane/load grounded to a neutral line by the utility.

2. Electrical system protective devices that automatically re-energize the circuit after a power line contact occurrence should be blocked or disengaged to inhibit this function.

3. Insulated barriers, which are not a part of nor an attachment to the crane and which will not allow contact between the energized electric power lines and the crane, load lines, or load.

4. Non-conductive barricades to restrict access to the crane work area.

b. Load control, when required, shall utilize tag lines of a non-conductive type.

c. A designated signaler, whose sole responsibility is to verify that the clearances established are maintained, shall be in constant contact with the crane operator.

d. The person responsible for the operation shall alert and warn the crane operator and all persons working around or near the crane about hazard of electrocution or serious injury and instruct them on how to avoid the hazard.

e. All non-essential personnel shall be removed from the crane work area.

f. No one shall be permitted to touch the crane or the load unless the signaler indicates it is safe to do so.

15.5.3.4.4 Crane in Transit With No Load and Boom Lowered (see Figure 15-15)

a. Cranes in transit with no load and boom lowered shall maintain clearance as specified in Table 15-3.

b. A designated signaler shall be assigned to observe the clearance and give warning before the crane approaches the above limits.

c. When planning transit of the crane, the effect of speed and terrain on the boom and crane movement shall be considered.

15.5.3.4.5 Crane Operation Near Transmitter Towers (see Figure 15-16)

a. Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be deenergized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

1. The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom.

2. Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters; crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

3. Combustible and flammable materials shall be removed from the immediate area prior to operations.

15.5.3.5 Ordinary Lifts

a. An appointed person shall classify each lift into one of the DOE categories (ordinary or critical) prior to planning the lift.

b. Hoisting and rigging operations for ordinary lifts require a designated leader who shall be present at the lift site during the entire lifting operation. If the lift is being made by only one person, that person assumes all responsibilities of the designated leader.

c. Leadership designation may be by written instructions, specific verbal instructions for the particular job, or clearly defined responsibilities within the crew's organizational structure.

d. The designated leader's responsibility shall include the following:

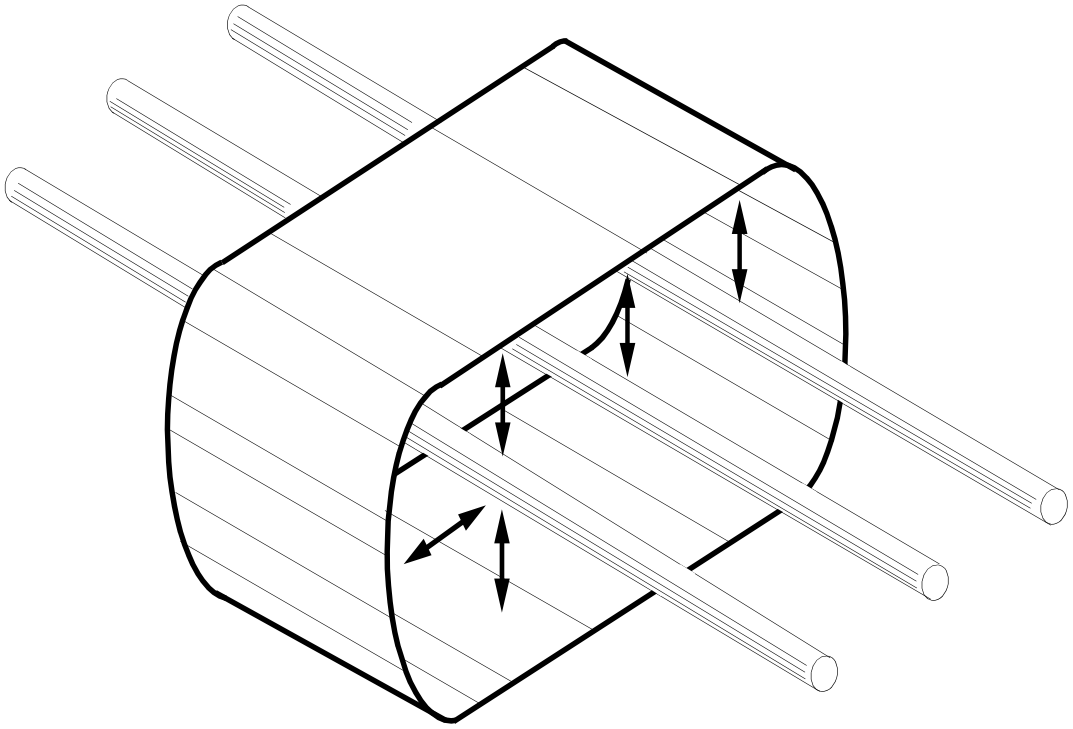


Figure 15-15. Danger zone for cranes and lifted loads operating near electrical transmission line.
(See Table 15-3 for minimum radial distance of prohibited zone.)

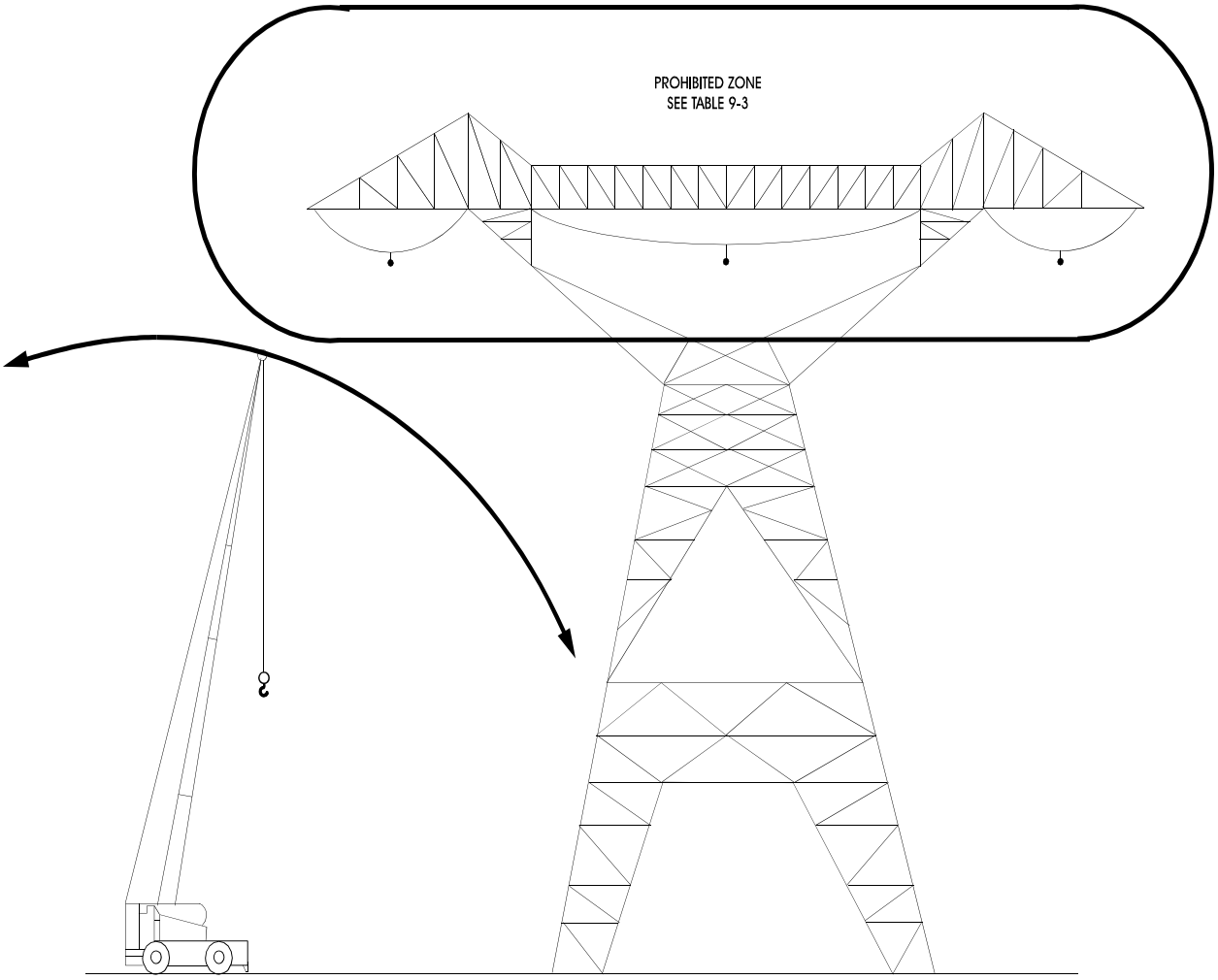


Figure 15-16. Danger zone for cranes and lifted loads operating near electrical transmission line.

1. Ensure that personnel involved understand how the lift is to be made.

2. Ensure that the weight of the load is determined, that proper equipment and accessories are selected, and that rated capacity is not exceeded.

3. Survey the lift site for hazardous/unsafe conditions.

4. Ensure that equipment is properly set up and positioned.

5. Ensure that a signaler is assigned, if required, and is identified to the operator.

6. Direct the lifting operation to ensure that the lift is completed safely and efficiently.

7. Stop the job when any potentially unsafe condition is recognized.

8. Direct operations if an accident or injury occurs.

e. The designated leader shall inspect all cranes to ensure that they are still within the inspection interval.

f. The designated leader shall inspect all lifting devices to ensure that the rated capacity of these items of equipment will not be exceeded.

15.5.3.6 Critical Lifts

a. The operating organization shall appoint a person-in-charge (PIC) of the lifting operation. This person shall meet the definitions of appointed, designated, and qualified, as described in Section 15.2, "Definitions."

b. The PIC shall ensure that a pre-job plan is prepared that defines the operation and shall include the following:

1. Identification of the items to be moved, the weight, dimensions, center of gravity, and the presence of hazardous or toxic materials.

2. Identification of cranes to be used by type and rated capacity.

3. Rigging sketches that include (as applicable):

i. Identification and rated capacity of slings, lifting bars, rigging accessories, and below-the-hook lifting devices.

ii. Load-indicating devices.

iii. Load vectors.

iv. Lifting points.

v. Sling angles.

vi. Boom and swing angles.

vii. Methods of attachment.

viii. Crane orientations.

ix. Other factors affecting equipment capacity.

4. Operating procedures and special instructions to operators including rigging precautions and safety measures to be followed as applicable.

c. Experienced operators who have been trained and qualified to operate the specific equipment to be used shall be assigned to make the lift.

d. Only designated, qualified signalers shall give signals to the operator. *However, obey a STOP signal at all times no matter who gives the signal.*

e. The responsible manager or designee shall review and approve the procedure and rigging sketches before the lift is made.

f. A pre-lift meeting involving participating personnel shall be conducted prior to making a critical lift. The critical lift plan/procedure shall be reviewed and questions shall be resolved.

g. If required by the critical lift procedure, a practice lift shall be done before the critical lift. Conditions for a practice lift should closely simulate actual conditions involving: weight, rigging selection and configuration, load movement path, and other relevant factors. Practice lifts should be done by the same crew, using the same lifting equipment.

15.5.4 Forklift Trucks

a. Know the rated capacity of the forklift and always operate within that capacity. Since the load rating for forklifts may be based on stability or hydraulic/structural competence, the rated capacity shall not be exceeded in operational application. Signs of tipping shall never be used to determine if a load is within the forklift's capacity.

b. Attachments almost always affect rated capacity of the truck. When a forklift truck is equipped with an attachment, the rated capacity of the truck/attachment combination shall be established by the truck manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

1. The rated capacity of an attachment/truck combination shall not be exceeded.

2. On every removable attachment (excluding fork extensions), a corrosion-resistant nameplate with the following information is required:

i. Model number

ii. Serial number on hydraulically actuated attachments

iii. Maximum hydraulic pressure (on hydraulically actuated attachments)

iv. Weight

v. Capacity

vi. The following instructions (or equivalent); "Capacity of truck and attachment combination may be less than capacity shown on attachment. Consult truck nameplate."

NOTE: The above information should be provided by the attachment manufacturer.

c. Modifications or additions that affect capacity or safe operation shall not be performed without prior written approval from the forklift truck manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

d. Ensure that battery recharging and maintenance takes place in designated areas where smoking, sparks, or open flames are prohibited. Verify the location and operability of eyewash and shower facilities before maintenance is performed. Wear eye protection, rubber gloves, and rubber aprons. Whenever battery maintenance is performed, any area of the body affected by contact with battery electrolyte shall be flushed with water immediately and all acid spills must be cleaned up at once.

e. Ensure that fueling of internal-combustion-powered forklift trucks takes place in designated areas. The vehicle engine must be turned off and smoking, sparks, or open flames shall be prohibited.

f. Handling liquefied petroleum gas (LPG) fuel presents a unique hazard. Therefore, to avoid injury while refueling with LPG fuel, precisely follow the refueling procedure in the operator's manual for the vehicle.

g. The operation of internal combustion-powered forklift trucks in confined spaces shall be prohibited unless special precautions are followed to preclude the buildup of carbon monoxide gas above prescribed levels.

h. Only qualified operators shall be permitted to operate forklift trucks. No one shall operate the equipment other than the person to whom it is assigned.

i. Report and correct any apparent mechanical deficiencies before operating the forklift truck.

15.5.4.1 Operating the Unit

The following requirements shall be observed by the operator when operating forklift trucks.

15.5.4.1.1 General

a. Safe operation is the responsibility of the operator. Report all accidents and "near misses" promptly.

b. The operator shall develop safe working habits and also be aware of hazardous conditions in order to protect himself, other personnel, the truck, and other material.

c. The operator shall be familiar with the operation and function of all controls and instruments before operating the truck.

d. Before operating any truck, the operator shall be familiar with unusual operating conditions which may require additional safety precautions or special operating instructions.

e. Be certain the truck has successfully passed a preuse inspection. A sample Pre-operational inspection checklist is included as Exhibit 1, which appears at the end of this chapter.

f. Do not start or operate the truck, any of its functions or attachments, from any place other than from the designated operator's position.

g. Keep hands and feet inside the operator's designated area or compartment. Do not put any part of the body outside the operator compartment of the truck.

h. Never put any part of the body within the reach mechanism of the truck or other attachments.

i. Avoid reaching through the mast for any purpose.

j. To safeguard pedestrians, understand the truck's limitations and observe the following precautions:

1. Do not drive a truck up to anyone standing in front of an object.

2. Ensure that personnel stand clear of the rear swing area before conducting turning maneuvers.

3. Exercise particular care at cross aisles, doorways, and other locations where pedestrians may step into the path of travel of the truck.

4. Do not allow anyone to stand or pass under the elevated portion of any truck, whether empty or loaded.

k. Do not permit passengers to ride on powered industrial trucks unless a safe place to ride has been provided by the manufacturer.

l. Ensure that fire aisles, access to stairways, and fire equipments is kept clear.

m. A powered industrial truck is considered unattended when the operator is more than 25 ft. (7.6m) from the truck, which remains in his view, or whenever the operator leaves the truck and it is not in his view.

n. Before leaving the operator's position the operator shall perform the following :

1. Bring truck to a complete stop.

2. Place directional controls in neutral.

3. Apply the parking brake.

4. Fully lower load-engaging means, unless supporting an elevated platform.

o. In addition, when leaving the truck unattended the operator shall perform the following:

1. Stop the engine or turn off the controls.

2. If the truck must be left on an incline, block the wheels.

3. Fully lower the load-engaging means.

p. Maintain a safe distance from the edge of ramps, platforms, and other similar working surfaces. Do not move railroad cars with a powered industrial truck.

q. Do not use a truck for operating or closing railroad car doors except as follows:

1. Unless the truck utilizes a device specifically designed for opening and closing railroad car doors and the operator is trained in its use.

2. The design of the door-opening device shall require the truck to travel parallel to the railroad car, with the force applied in a direction parallel with the door travel.

3. Care should be exercised when engaging the railroad car door with the door opening device, in order to prevent damage to the doors and/or fork truck by heavy impact forces.

4. The entire door opening operation shall be in full view of the operator.

5. The fork truck shall always be positioned to safeguard the dock attendant while removing the door lock pin.

6. Whenever a railroad car door requires an abnormal force to open, the truck operator shall report the condition to his supervisor.

r. Wheel stops, hand brakes, or other recognized positive protection shall be provided to prevent railroad cars from moving during loading or unloading operations.

s. Consider both the truck and load weight when operating in railcars and semitrailers.

t. Inspect floors on trucks, boxcars, unfamiliar ramps, or platforms before start of operation.

u. Other workers should not be inside the truck when the forklift truck is performing loading or unloading operations. Load arrangements and spacing issues should be determined before the forklift enters the truck.

v. Fixed jacks or supports may be needed to prevent upending or corner dipping when powered industrial trucks are driven on and off semitrailers that are not coupled to the tractor.

w. The brakes of highway trucks shall be set and wheel chocks placed under the rear wheels to prevent the trucks from rolling while they are boarded.

x. Care shall be taken to not contact overhead installations such as lights, wiring, pipes, sprinkler systems, etc. If in doubt, measure.

y. Motorized hand trucks shall not be ridden unless they are of the hand/rider design.

15.5.4.1.2 Traveling

a. Observe all traffic regulations and under all travel conditions, operate the truck at a speed that will permit it to be brought to a stop in a safe manner. Unless facility-specific procedures state otherwise, the guideline is: within plant buildings - 5 mph; on plant roads - 15 mph. Drive slowly around curves.

b. Yield the right of way to pedestrians and emergency vehicles. Whenever possible, establish eye contact with approaching pedestrians or vehicle drivers before continuing.

c. Do not pass another truck traveling in the same direction at intersections, blind spots, or at other locations where vision is obstructed.

d. Slow down and sound horn at cross aisles and other locations where vision is obstructed.

e. Railroad tracks shall be crossed diagonally whenever possible.

f. Never travel with forks raised to unnecessary heights. Approximately 4 to 6 inches (10 to 15 cm) above floor level is adequate.

g. Do not park closer than 6 ft (1800 mm) to the nearest rail or a railroad track.

h. Face in the direction of travel, except if the load being carried obstructs forward view. In such cases travel with the load trailing.

i. When ascending or descending grades, ramps, and inclines:

1. In excess of 5 percent grade, drive loaded rider trucks with the load upgrade.

3. Use low gear or slowest speed control.

4. Operate unloaded trucks with the load-engaging means downgrade.

5. The load and load-engaging means shall be tilted back, if applicable and raised only as far as necessary to clear the road surface.

6. Avoid turning if possible, and normally travel straight up and down.

j. While turning, be cautious of rear end swing and keep clear of the edge of loading docks.

k. Make starts, stops, turns, or direction reversals in a smooth manner so as not to shift load and/or overturn the truck.

l. Do not indulge in stunt driving or horseplay.

m. Slow down for wet and slippery floors.

n. Before driving over a dockboard or bridge plate, be sure that it is properly secured.

o. Drive carefully and slowly across the dockboard or bridge plate, and never exceed its rated capacity.

p. Do not drive trucks onto any elevator unless specifically authorized to do so. In cases operation are authorized:

1. Do not exceed the capacity of the elevator.

2. Approach elevators slowly, and then enter squarely after the elevator car is properly leveled.

3. Once on the elevator, neutralize the controls, shut off the power, and set brakes.

4. It is advisable that all other personnel leave the elevator before truck is allowed to enter or leave.

q. Unless a towing hitch is supplied by the manufacturer, do not use forklift trucks as tow trucks. When a towing hitch is provided, use tow bars rather than wire rope for towing.

r. At the end of the operator's shift, return the forklift truck to its assigned parking place, set brakes, fully lower load-engaging means, place controls in neutral position, turn ignition off, and secure the key.

s. If the truck is equipped with a seat belt, use it.

15.5.4.1.3 Loading

a. Since the load rating for forklifts may be based on stability or hydraulic or structural competence, do not exceed the rated capacity in operational application.

b. The designated person shall ensure that the weight of a load approaching the rated capacity (combination of weight and location of the center of gravity) has been determined within -10 percent, +0 percent before it is lifted.

c. Only stable, safely arranged loads shall be handled. Block and secure them if necessary.

d. Caution shall be exercised when handling off-center loads which cannot be centered.

e. Always spread the forks to suit the load width.

f. Extra caution is required when handling loads exceeding the dimensions used to establish truck capacity. Stability and maneuverability may be adversely affected.

g. The forks shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.

h. Do not transport loads or miscellaneous items within the operator’s compartment or other areas of the truck, unless a secure area hasbeen provided and designated by the user.

i. A load backrest extension shall be used whenever necessary to minimize the possibility of the load or part of it from falling rearward.

j. Do not attach or operate any attachment on a forklift truck that has not been approved for use by the forklift truck manufacturer.

k. When attachments are used, extra care shall be taken in securing, manipulating, positioning, and transporting the load.

l. Operate trucks equipped with attachments as partially loaded trucks when not handling a load.

m. Fork length should be at least two thirds of the load length.

n. Use extreme care when tilting load forward or backward, particularly when high tiering.

o. Do not tilt forward with forks elevated except to pick up or deposit a load over a rack or stack.

p. When stacking or tiering, use only enough backward tilt to stabilize the load.

q. Rigging loads from the tines of a forklift, (attaching rigging to the forks to support a suspended load) shall only be performed by qualified personnel in accordance with approved site procedures.

r. Never lift with one fork without an engineering analysis and approval.

s. Use guides and signalers as necessary. If in doubt, check the conditions personally before proceeding. Standard hand signals are shown in Figure 15.17 "Hand Signals."

t. Do not block fire extinguishers, fire protection sprinklers, or alarm stations when stacking loads.

15.5.4.2 Ordinary Lifts

a. An appointed person shall classify each lift into one of the DOE categories (ordinary or critical) before the lift is planned.

b. Hoisting and rigging operations for ordinary lifts require a designated leader who shall be present at the lift site during the entire lifting operation. If the lift is being made by

only one person, that person assumes all responsibilities of the designated leader.

c. Leadership designation may be by written instructions, specific verbal instructions for the particular job, or clearly defined responsibilities within the crew's organizational structure.

d. The designated leader's responsibility shall include the following:

1. Ensure that personnel involved understand how the lift is to be made.

2. Ensure that the weight of the load is determined, that proper equipment and accessories are selected, and that rated capacity is not exceeded.

3. Survey the lift site for hazardous/unsafe conditions.

4. Ensure that equipment is properly set up and positioned.

5. Ensure that a signaler is assigned, if required, and is identified to the operator.

6. Direct the lifting operation to ensure that the lift is completed safely and efficiently.

7. Stop the job when any potentially unsafe condition is recognized.

8. Direct operations if an accident or injury occurs.

15.5.4.3 Critical Lifts

a. The operating organization shall appoint one PIC of the lifting operation. This person shall meet the definitions of appointed, designated, and qualified, as described in Section 15.2, "Definitions."

b. The PIC shall ensure that a pre-job plan is prepared that defines the operation and shall include the following:

1. Identification of the items to be moved, the weight, dimensions, center of gravity, and the presence of hazardous or toxic materials.

2. Identification of forklifts to be used by type and rated capacity.

3. Rigging sketches that include (as applicable):

i. Identification and rated slings, lifting bars, rigging accessories, and below-the-hook lifting devices.

ii. Load-indicating devices.

iii. Load vectors.

iv. Lifting points.

v. Sling angles.

vi. Boom and swing angles.

vii. Methods of attachment.

viii. Forklift orientations.

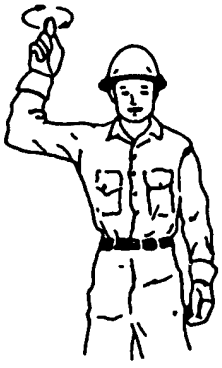
ix. Other factors affecting equipment capacity.

4. Operating procedures and special instructions to operators including rigging precautions and safety measures to be followed as applicable.

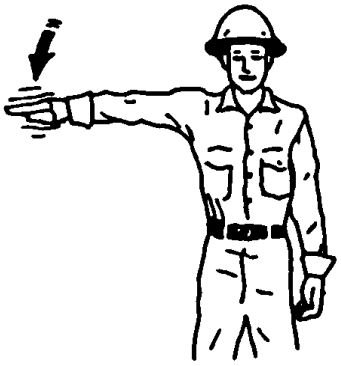
c. Only experienced operators who have been trained and qualified to operate the specific equipment to be used shall be assigned to make the lift.

d. Only designated, qualified signalers shall give signals to the operator. *However, obey STOP signal at all times no matter who gives the signal.*

e. The responsible manager or designee shall review and approve the procedure and rigging sketches before the lift is made.

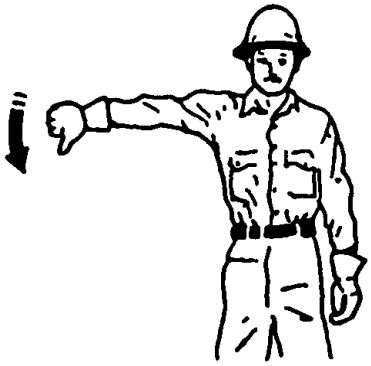


RAISE THE TINES. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

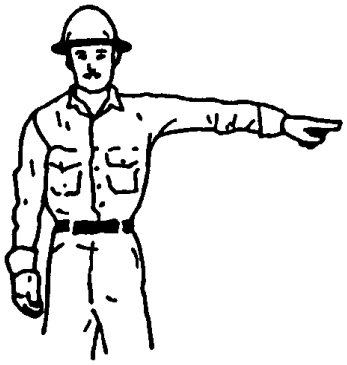


LOWER THE TINES. With arm extended, palm down, lower arm vertically.

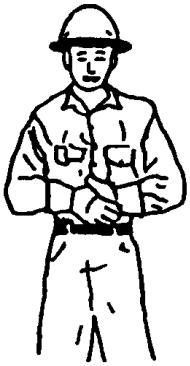
TILT MAST BACK. With forearm vertical, thumb extended, jerk thumb over shoulder.



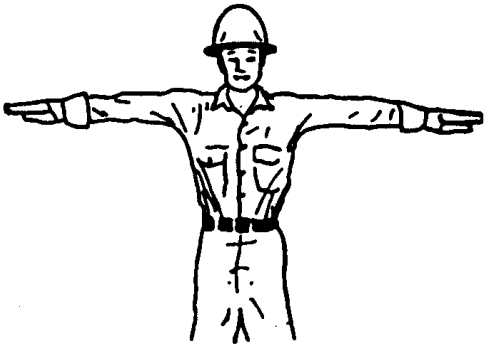
TILT MAST FORWARD. With arm extended, thumb down, lower arm vertically.



MOVE TINES IN DIRECTION FINGER POINTS. With arm extended, palm down, point forefinger in direction of movement.



DOG EVERYTHING. Clasp hands in front of body.



STOP. Extend both arms, palms down.

Figure 15-17. Standard hand signals for controlling forklift operation.

15.6 LIFTING PERSONNEL

15.6.1 Mobile Cranes/Boom Trucks

This section specifies the operation, design, testing, and inspection requirements for the use of personnel lift platforms or baskets suspended from mobile cranes and/or boom trucks. This section implements the requirements of 29 CFR 1926.550(g) "Cranes and Derricks" and ASME B30.23, "Personnel Lifting Systems."

15.6.1.1 Personnel Lifting Evaluation

a. The use of a crane to hoist employees on a personnel lift platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous or is not possible because of structural design or worksite conditions.

b. The manager specifically responsible for the overall work function to be performed shall determine that the erection, use, and dismantling of conventional means of reaching the work site (i.e., scaffold, ladder, stairway, aerial lift, or elevating work platform) would be more hazardous or is not possible because of structural design or worksite conditions.

c. For each personnel lifting procedure, the manager responsible for the task shall authorize the use of a crane-suspended work platform and attest to the need for the operation through a written justification attesting to that need. A statement describing the operation and its time frame shall be included. The statement, after being approved by the authorizer, shall be retained at the job site.

d. The manager specifically responsible for the overall work function shall not allow or require any operator to lift personnel under the following circumstances:

1. The operator does not feel physically or mentally fit to perform the operation.

2. The operator has been working for more than 10 hours prior to the start of the lift or the lift will not be completed before the operator has been working for 12 hours.

3. The operator did not have at least eight hours off, immediately prior to the work shift containing the person.

15.6.1.2 Designated Leader

a. The Authorizing Manager shall appoint a Designated Leader for the entire personnel lifting operation.

b. The Designated Leader shall ensure that a pre-job plan is prepared that defines the operation. The Designated Leader shall ensure:

1. At each new job site prior to hoisting personnel, the personnel lift platform, rigging, and hook block shall be proof-tested by a qualified inspector to 125 percent of the personnel platform's rated capacity by holding it suspended for 5 minutes with the test load suitably distributed on the personnel platform.

2. After proof-testing, any deficiencies revealed by inspection, or by the proof test, shall be corrected and another proof-test conducted.

3. Any modification to the personnel lift platform or rigging shall require retesting.

4. Test reports shall be kept on file and shall be readily available to appointed personnel.

5. A meeting is held prior to the trial lift with the designated leader, qualified operator, signaler, persons to be lifted, and the person responsible for overall worksite safety to plan and review procedures to be followed. Procedures for entering and leaving the personnel platform and the points at which persons will enter and leave the device shall be reviewed. This meeting shall be held at each new work location, and shall be repeated for any employees newly assigned to the operation.

c. The designated leader and the crane operator shall determine that:

1. The crane shall be uniformly level within 1 percent of level grade and firm footing exist under both crawler tracks or under each outrigger float. Cribbing mats under tracks or blocks under outrigger floats are used as necessary to provide a firm and substantial footing.

2. Cranes equipped with outriggers shall have outriggers extended in accordance with the manufacturer's instructions.

3. Crane systems, controls, operator aids, and safety devices are activated and functioning properly.

4. No interferences exist.

5. The total weight of the loaded personnel lift platform (including personnel) and related rigging shall not exceed 50 percent of the crane rating under the planned conditions of use.

6. The personnel lift platform shall not be loaded in excess of its rated load capacity. The number of employees occupying the platform shall not exceed the number required for the work being performed.

15.6.1.3 Trial Lift

a. Each shift, before personnel initially enter the personnel lift platform, the operator and signaler shall conduct a trial lift. The trial lift shall include:

1. Loading the unoccupied personnel platform to at least the maximum anticipated load. Materials and tools to be used during the actual lift, if secured to prevent displacement, can be in the platform for the trial lift.

2. The trial lift shall be made from the location where personnel will enter the platform to each location where the platform will be hoisted and positioned. It is acceptable to perform a single trial lift on each shift for all locations to be reached from a single setup position.

3. The trial lift shall be repeated whenever:

i. The crane (mobile) is moved and set up in a new location or returned to a previously used location.

ii. When the lift route is changed, unless the operator determines that the safety of the hoisted personnel is not affected.

iii. If a different crane operator is assigned.

15.6.1.4 Lifting Operations

15.6.1.4.1 Pre-Lift Meeting

a. A meeting attended by the operator, the ground crew, signaler(s), person(s) to be lifted, and the designated leader shall be held each shift to plan and review procedures to be followed, including:

1. Points at which persons will enter and leave the platform.

2. Procedures for entering and leaving the platform.

3. Special precautions if personnel will perform work from the suspended platform.

b. This meeting shall be held at each new work location, and shall be repeated for any employees newly assigned to the operation.

15.6.1.4.2 Pre-Lift Inspection

a. After the trial lift, prior to lifting personnel:

1. A visual inspection of the crane, rigging, and personnel lift platform shall be conducted by a qualified inspector. Any defects found that create a safety hazard shall be corrected prior to hoisting personnel.

2. The platform shall be lifted a few inches and inspected to ensure that it is secure and properly balanced.

15.6.1.4.3 Lifting Personnel

a. Prior to hoisting personnel in a personnel lift platform ensure that:

1. No hazardous conditions exist with the platform and its associated rigging.

2. The hoist line is not wrapped around any part of the platform.

3. Hoist ropes are free of kinks.

4. Multiple-part lines are not twisted around each other.

5. The primary attachment is centered over the platform.

6. Ropes are properly seated on drums and sheaves.

7. The crane is with in 1 percent of level.

8. The crane has an anti two-block device installed and operational.

b. Employees being hoisted or working in a personnel lift platform shall:

1. Remain in continuous sight of, and in direct communication with, the operator or signaler. In situations where direct visual contact with the operator is not possible and the use of a signaler would create a hazard for that person, direct communication alone (such as a two-way radio) may be used.

2. Keep all parts of their bodies inside the suspended personnel lift platform during raising, lowering, and positioning to avoid pinch points.

3. Wear body harnesses with lanyards attached to the lower load block or overhaul ball, or to a structural member within the platform that is capable of supporting a fall impact.

4. Not stand on or work from the top rail, midrail, or toe board of the suspended personnel platform.

5. When working above water, the requirements of 29 CFR 1926.106 (Occupational Safety and Health Regulations for Construction) shall also apply.

6. When welding is being performed from the personnel lift platform, the electrode holders shall be protected from contact with metal components of the personnel platform.

c. Operators of cranes hoisting personnel in a personnel lift platform shall:

1. Before commencing or continuing the lift, consult with the designated leader when ever there is any doubt as to the safety of the lift.

2. Remain at the controls when the personnel lift platform is occupied.

3. Operate the crane so that lowering will be power-controlled (no free-fall).

4. Ensure movement of the personnel lift platform is performed in a slow, controlled, cautious manner with no sudden movements of the crane or the platform. The lifting or lowering speed shall not exceed 100 ft/min (30 m/min).

5. After the personnel lift platform is positioned, set all brakes and locks on the lift crane before personnel perform any work.

6. If the personnel lift platform cannot be landed, ensure it is tied to the structure before personnel get off or on.

7. Ensure that no lifts are made on another of the crane's load lines while personnel are suspended on the personnel lift platform.

d. Suspended personnel lift platforms shall be used only for personnel, their tools, and sufficient materials to do their work. They shall not be used for transporting bulk materials.

e. Personnel lift platforms should not be used in winds greater than 20 mph (32.2 km/hr), electric storms, snow, ice, sleet, or other adverse weather conditions that could affect the safety of personnel.

f. Use tag lines to control motion of occupied personnel lift platforms unless their use creates an unsafe condition.

g. Cranes shall not travel while personnel are in the platform. Exceptions to this provision shall be approved by the manager specifically responsible for the overall work function and precautions to be taken documented in the personnel lift plan.

15.6.1.5 Mobile Cranes/Boom Trucks

Mobile cranes are designed and intended for handling materials, not personnel. In addition to the general requirements in Section 15.5.3.1, "Operating the Unit," the following requirements shall be met when lifting personnel with a mobile crane:

a. Personnel are permitted to ride only in one of the following:

1. A personnel lift platform that is supported from the crane's hook which meets the requirements of Section 15.6.1.6, "Personnel Platform."

2. A personnel basket attached directly to the boom which is approved by the crane manufacturer.

b. Cranes and derricks with variable-angle booms shall be equipped with a boom-angle indicator that is readily visible to the operator.

c. Cranes with telescoping booms shall be equipped with a device to indicate clearly to the operator, at all times, the boom's extended length, or an accurate determination of the load radius to be used during the lift shall be made prior to hoisting personnel.

d. A positive-acting device shall be used that prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used that deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage-prevention feature).

e. Cranes having booms in which lowering is controlled by a brake without aid from other devices which slow the lowering speeds is prohibited.

f. Crane load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load.

g. Hydraulic cranes shall have check valves or other devices that will prevent uncontrolled movement in the event of system failure, engine failure, or hose rupture.

h. Cranes shall have a means to prevent retraction of hydraulically or pneumatically activated outriggers or stabilizers in the event a hydraulic or pneumatic line fails.

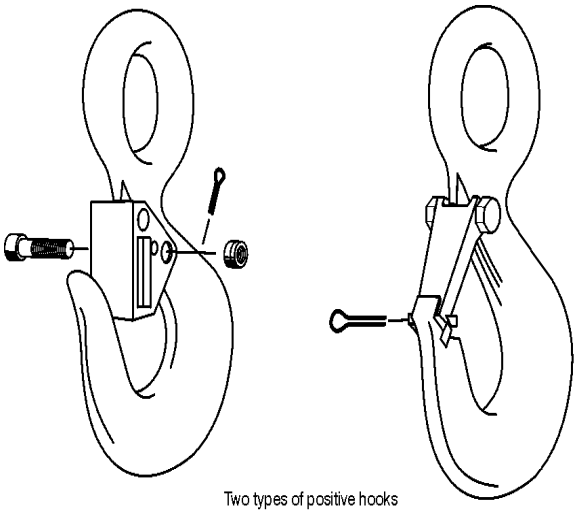


Figure. 15-18. Positive Hooks

i. Pendant supported, jib type, boon extensions without positive stops are prohibited for personnel lifting.

j. Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of the type that can be closed and locked, eliminating the hook throat opening. (Figure 15-18). Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used.

15.6.1.6 Personnel Lift Platform

15.6.1.6.1 Platform Design and Construction

There is no attempt to comprehensively address platform design and construction in this section. Nevertheless, because many platform design and construction features can be observed and should be known by the platform user, (See Figures 15-19) the following key design and construction requirements are presented:

a. The personnel lift platform and suspension system shall be designed by a qualified person competent in structural design and familiar with national consensus standards governing personnel platform design.

b. All welding of the platform shall be performed by a qualified welder in accordance with ANSI/AWS D1.1. Where special steels or other materials are used, the manufacturer shall provide welding procedures. Welds shall be inspected by a qualified inspector.

c. The personnel lift platform shall have:

1. A minimum design factor of five.

2. A plate specifying its empty weight and its rated load capacity or maximum intended load.

3. Perimeter protection consisting of a top rail approximately 45 in. (115 cm) high, a toe board at least 4 in. (10 cm) high, and a midrail approximately halfway between the top rail and the toe board.

4. A grab rail inside the personnel lift platform to minimize hand exposure.

5. Anchorage points within the platform for attaching personnel fall protection lanyards.

6. The sides of the platform enclosed from the toe board to the midrail with solid

construction or expanded metal having openings no greater than ½ in. (1.27 cm).

7. Platform access gates, including sliding or folding types, if installed, shall have a positive acting device to restrain the gate from accidental opening. Swinging type access gates shall open only to the interior of the personnel lift platform.

8. Rough edges exposed to contact by employees surfaced (ground smooth) to prevent injury.

9. High-visibility color or marking for easy identification.

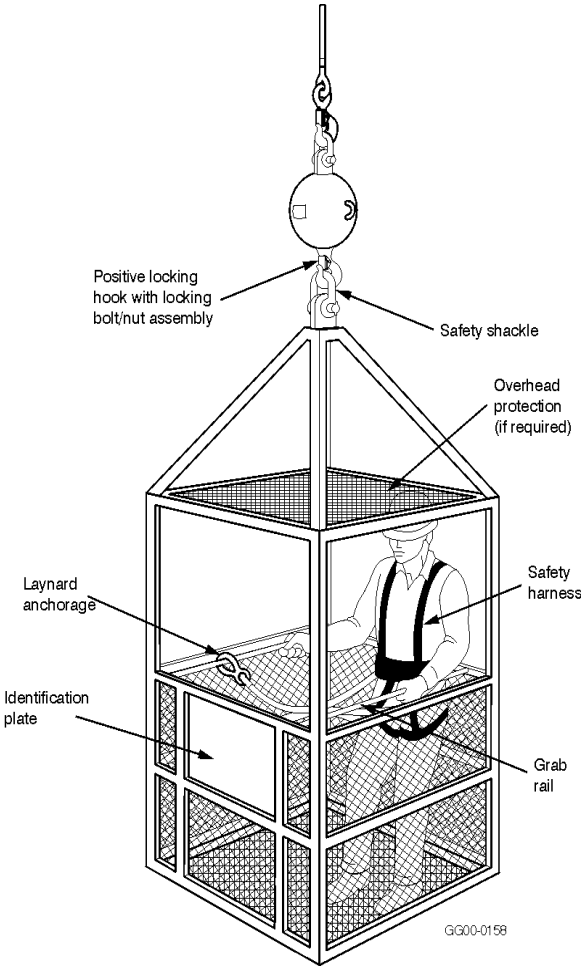


Figure. 15-19. Personnel Lift Platform

d. In addition to wearing hard hats, personnel shall be protected by overhead protection on the personnel lift platform when there is an overhead hazard. Sufficient headroom shall be provided to allow employees to stand upright in the platform.

15.6.1.6.2 Platform Suspension System

a. Wire rope, shackles, rings, master links, and other rigging hardware must be capable of supporting, without failure, at least five times the maximum intended load applied or transmitted to that component and guided by the following:

1. One-leg system - design factor of seven.

2. Two or three-leg system - design factor of five for each leg.

3. Four-leg system - design factor of five with only three legs under stress.

4. Where rotation resistant rope is used, the slings shall be capable of supporting without failure at least ten times the maximum intended load.

b. Sling suspension systems shall utilize a master link or safety type shackle to connect the personnel lift platform to the load line to ensure that the load is evenly divided among the suspension system legs.

c. The suspension system shall be designed to minimize tipping of the platform due to movement of employees occupying the platform.

d. The sling suspension system attaching the personnel lift platform to the hoist line shall not be used for any other purpose when not hoisting personnel.

e. Shackles used in any part of the suspension system shall be a safety type (bolt-type shackle with nut and cotter pin).

f. All eyes in wire rope slings shall be fabricated with thimbles.

g. Wire rope clips, wedge sockets, or knots shall not be used in suspension system sling assemblies.

h. Synthetic webbing, natural or synthetic fiber rope shall not be used for the suspension systems.

i. Chain sling suspension systems shall use a minimum of grade 80 chain.

15.6.1.7 Inspections

All equipment used in the lifting of personnel shall be inspected, tested, and maintained to protect against failure during lifting operation.

15.6.1.7.1 Frequent Inspections

a. The platform manufacturer shall furnish complete inspection criteria for the platform users. The criteria shall address all inspection frequency classifications and shall cover:

1. The platform
2. Rigging components
3. Fasteners
4. All safety features and attachments.

b.. Prior to initial use and at each new job the platform shall be inspected by a qualified inspector in accordance with the instructions provided by the manufacturer.

c. The platform, suspension system, attachment points, and any motion controls shall be inspected at least each day, before use, by a designated person. The inspection is to identify conditions that have been specifically indicated by the platform manufacturer, or a qualified person, as potentially creating a hazardous operating condition. Visually inspect items such as the following:

1. Platform and suspension system markings to ensure all information is legible.
2. Platform structure:
   i. Load supporting members, welds and bolts.
   ii. Perimeter protection; top rail, midrail, toe board, and barrier from toe board to midrail.
   iii. Fall protection device anchorage points.
   iv. Gate locking mechanisms.
   v. Platform flooring.
   vi. Suspension attachment points.
3. Attachment mechanisms:
   i. Master links, shackles, slings, bolt-ups, etc.
4. Special purpose items:
   i. Overhead protection.
   ii. Platform controls

d. For frequent inspections, dated records for the hoisting equipment and personnel lift platform shall be made and kept by the platform user for the duration of the personnel lift operation.

15.6.1.7.2 Periodic Inspections

a. At least once every 12 months, or as required by the personnel lift platform manufacturer, a periodic inspection of the platform shall be performed by a qualified inspector in accordance with the instructions provided by the manufacturer.

b. Platforms which have been out of service for 12 or more consecutive months shall receive a periodic inspection prior to use.

c. Dated inspections records for the platform shall be made. The last periodic inspection records shall be kept with the platform and available for review.

d. Hoisting equipment shall be inspected in accordance with inspection requirements of Section 15.4. “Inspection and Testing.”

15.6.1.8 Testing

a. The platform manufacturer shall perform testing to include testing the personnel lift platforms:

1. Suspension mechanisms or attachment components.
2. Occupant safety features.
3. Platform rating
4. When the complete production platform is not supplied by one manufacturer, the manufacturers platform test shall be conducted at final assembly by the platform assembler or a qualified inspector.

b. Slings (wire rope or chain) shall receive an initial load test before installation by applying a test load to each individual leg equal to 200 percent the rated load of the leg. If a master link or safety shackle is used in the suspension system, it shall be tested to at least the weight of the platform plus the platform rating.

1. All tested components shall be visually inspected after testing.

2. Any components showing damage shall be replaced and the test procedure repeated.

c. Non-destructive testing of the platform's suspension system attaching points.

15.6.1.8.1 Rated Load Test

a. At least annually and at each new job site, before personnel are hoisted, the personnel platform and suspension system shall be load-tested to 125 percent of the personnel platform's rated capacity.

b. The platform shall be held in a suspended position for 5 minutes with the load suitably distributed.

c. Load-testing may be done concurrently with the trial lift.

d. After load-testing, any deficiencies revealed during the inspection shall be corrected and another load test shall be conducted.

e. Structural repair or modification to the platform requires load-testing to 150 percent of the rated capacity.

f. When feasible, the hoisting equipment to be used for lifting personnel should be the equipment used to perform the load-test at the job site.

g. Dated test reports shall be kept on file and shall be readily available to appointed personnel.

h. Hoisting equipment shall be tested in accordance with testing requirements of 15.4 "Inspection and Testing."

15.6.2 Forklift Trucks

This section specifies the operation, design, testing, and inspection requirements for the use of personnel lift platforms used on forklift trucks. This section implements the requirements of 29 CFR 1910.178 "Powered Industrial Trucks" and ASME B56.1 "Safety Standard for Low Lift and High Lift Trucks." If a work platform is used on forklift trucks designed and intended for handling materials, take the following precautions:

a. Use a lift platform manufactured for the purpose of lifting personnel with a forklift truck. The platform shall include:

1. A 4-in. (10-cm) minimum height toe plate provided on the work platform.

2. The floor of the platform located not more than 8-in (20-cm) above the upper face of the supporting truck fork blade.

3. A restraining means such as a guard rail having a height above the platform floor of not less than 36 in. (90-cm) or more than 42 in. (110-cm) around its upper periphery and including a midrail.

4. An access opening in the guard rail maybe hinged or removable, or chains may be used if proper positioning is easily accomplished and a secured condition is discernible.

5. Guard rails and access openings shall be capable of withstanding a concentrated force of 200 lb (91 kg) in any direction.

6. Means to securely attach the platform to the lifting carriage or forks in such a manner that it cannot slide or bounce off the forks.

7. Means to correctly locate the platform centered laterally on the truck.

8. Floor dimensions that neither exceed two times the load center distance listed on the truck nameplate, measured parallel to the longitudinal center plane of the truck, nor have a width greater than the overall width of the truck (measured across the load bearing tires) plus 10 in. (25-cm) on either side.

9. The following information should be prominently indicated on the platform:

   i. maximum load including personnel and equipment;

   ii. weight of empty platform;

   iii. minimum capacity of the truck on which the platform can be used.

b. The combined weight of the platform, load, and personnel shall not exceed one-half of the capacity as indicated on the nameplate of the truck on which the platform is used.

c. Whenever a truck (except for high-lift order-picker trucks) is equipped with vertical hoisting controls elevateable with the lifting carriage or forks, take the following additional precautions to protect personnel:

1. Means shall be provided whereby personnel on the platform can shut off power to the truck.

2. Means shall be provided to render inoperative all operating controls on the elevating platform, when the controls on the elevating platform have been selected for use; only one

location of controls shall be capable of being operated at one time.

3. Emergency-lowering means available at ground level should be provided; such means shall be protected against misuse.

d. Take the following precautions whenever personnel are elevated with a forklift truck:

1. Ensure the truck has a firm and level footing.

2. Place all travel controls in neutral and set parking brake.

3. Before elevating personnel, mark area with cones or other devices to warn of work by elevated personnel.

4. Lift and lower personnel smoothly, with caution, and only at their request.

5. Avoid overhead obstructions and electric wires.

6. Keep hands and feet clear of controls other than those in use.

7. Move truck and/or platform slowly, only for minor adjustments in horizontal positioning when personnel are on the platform, and only at their request.

8. Ensure the mast is vertical - do not operate on a side slope.

9. The platform is horizontal and never tilted forward or rearward when elevated.

10. Personnel are to remain on the platform floor. The use of railings, planks, ladders, etc., on the platform for the purpose of achieving additional reach or height is prohibited.

11. Ensure personnel and equipment on the platform do not exceed the available space.

12. Lower platform to floor level for personnel to enter and exit. Do not climb on any part of the truck in attempting to enter or exit.

13. The operator shall remain in the control position of the forklift truck.

14. Be certain that the lifting mechanism is operating smoothly throughout its entire lift height, both empty and loaded, and that lift limiting devices and latches, if provided, are functional.

15. Means shall be provided to protect personnel from moving parts of the forklift truck that present a hazard when the personnel platform is in the normal working position.

16. Overhead protection, as necessary for operating conditions, shall be provided.

17. Do not transport personnel from one location to another while they are on the work platform.

18. When not in the operating position, engage the parking brake and block the wheels.

19. Be certain that required restraining means such as railings, chains, cable, body belts with lanyards, or deceleration devices, etc., are in place and properly used.

Exhibit I is intended to be a sample form only.
The equipment manufacturer's inspection/testing
criteria supercede any other criteria.
In cases where the equipment manufacturer does not include
inspection/testing criteria, other forms developed to facilitate
required inspection/testing are acceptable.

INTENTIONALLY BLANK

EXHIBIT I
(SAMPLE FORM)

MOBILE CRANE PRE-OPERATIONAL CHECKLIST
(Records Are Not Required)

STATUS CODE: SAT - Satisfactory **UNSAT** - Unsatisfactory **R** - Repaired **N/A** - Not Applicable

EXTERNAL	CODE	COMMENT
Check Fuel Cap		
Crankcase Oil Level		
Cold Weather Starting Aid		
Radiator		
Antifreeze & Coolant		
Cleaners		
Fan Belts		
Pumps & Motors		
Battery		
Muffler		
Brake & Air System (Bleed)		
Hydraulic Reservoir		
Hydraulic Oil Filter		
All Hydraulic Hoses & Fittings		
Auto Transmission Oil Level		
Air Compressor Oil Level		
Outriggers & Boxes		
Outriggers Float Pads		
Tire Condition & Pressure		
Wheel Lugs		
Hoists		
Boom Attachments		
Lubrication/Grease or Oil Leaks		
All Sheaves Lubed		

EXHIBIT I
(SAMPLE FORM)

MOBILE CRANE PRE-OPERATIONAL CHECKLIST
(Records Are Not Required)

EXTERNAL	CODE	COMMENT
Wire Rope Kinks or Breaks		
Wire Rope Dirt & Lube		
Hook & Hook Block		
Counterweight & Torque		
Handrails		
Lamps:		
- Turn Signals		
- Flashers		
- Headlamps-		
- Cab		
- Boom		
- Backup		
Welds & Cracks:		
- Hoists		
- Boom		
- Sheaves		
- Hook		
- Block		
- Motor		
- Valves		
- Cylinders		
REMARKS:		

EXHIBIT I
(SAMPLE FORM)

MOBILE CRANE PRE-OPERATIONAL CHECKLIST
(Records Are Not Required)

INSIDE CAB	CODE	COMMENT
Fire Extinguisher Pressure		
Operator Manual & Load Chart		
Hand Signal Chart		
Glass		
Windshield Wiper		
GAUGES: Oil, Fuel, Amp		
Lights & Horn		
Backup Alarm		
Heater		
Boom Angle Indicator (PAT)		
Load Moment Indicator		
Anti Two Block		
Boom Stops		
Gearshift Control		
Foot & Parking Brakes		
Swing Brake		
Control Lever Linkage		
Throttle Linkage		
Engine RPM		
REMARKS:		

INTENTIONALLY BLANK

EXHIBIT II
(SAMPLE FORM)

MOBILE CRANE FREQUENT INSPECTION REPORT

MODEL: _____	**SERIAL #**: _____	**HOUR METER**: _____

STATUS CODE: **SAT** - Satisfactory **UNSAT** - Unsatisfactory **R** - Repaired **N/A** - Not Applicable

FREQUENT	**CODE**	**COMMENT**
Check Bolt Torque:		
- Tranmission Mount		
- Turntable		
- Engine Mount		
- Hoist Mount		
- Axle Mount		
Engine RPM		
Muffler Connections		
Wiring Harness		
Battery Cable		
Battery Water Level		
Master Cylinders		
Pump Drive Gearbox		
Swing Gearbox		
Axle Lockout		
Axle Differential		
Axle Planetary Oil		
Welds & Cracks		
- Hoist		
- Boom		
- Sheaves		
- Hook		
- Block		

EXHIBIT II
(SAMPLE FORM)

MOBILE CRANE FREQUENT INSPECTION REPORT

FREQUENT	CODE	COMMENT
- Motor		
- Valves		
- Cylinders		
Lamps:		
- Turn Signals		
- Headlamps		
- Flashers		
- Cab		
- Boom		
- Backup		
Boom Sheaves		
Boom Alignment		
Jib Alignment		
Machine Structure		
Clean/Change:		
- Differential Breather		
- Fuel Filter Screen		
- Compressor Strainer		
- Transmission Filter		
Drum		
Wire Rope: Dirt/Lube/Kinks		
Hook & Latch		
Block & Sheaves		
Guards in Position		
Emergency Stop		

EXHIBIT III
(SAMPLE FORM)

MOBILE CRANE PERIODIC INSPECTION REPORT

MODEL: _____ **SERIAL #**: _____ **HOUR METER**: _____		
STATUS CODE: **SAT** - Satisfactory **UNSAT** - Unsatisfactory **R** - Repaired **N/A** - Not Applicable		
PERIODIC	**CODE**	**COMMENT**
Check Bolt Torque:		
- Transmission Mount		
- Turntable		
- Engine Mount		
- Gearbox Mount		
- Axle Mount		
Engine RPM		
Muffler Connections		
Wire Harness		
Battery Cable		
Battery Water Level		
Master Cylinders		
Pump Drive Gearbox		
Swing Gearbox		
Axle Lockout		
Axle Differential		
Axle Planetary Oil		
Boom Sheaves		
Boom Alignment		
Jib Alignment		
Machine Structure		
Drum		
Wire Rope Dirt/Lube/Kinks		

EXHIBIT III
(SAMPLE FORM)

MOBILE CRANE PERIODIC INSPECTION REPORT

PERIODIC	CODE	COMMENT
Clean/Change		
- Differential Breather		
- Fuel Filter Screen		
- Compressor Strainer		
- Transmission Filter		
Drum		
Wire Rope: Dirt/lube/Size/Kink		
Hook & Latch		
Block & Sheave		
Guards in Position		
Emergency Stop		
Welds & Cracks:		
- Hoists		
- Boom		
- Sheaves		
- Hook		
- Block		
- Motor		
- Valves		
- Cylinders		
Lamps:		
- Turn Signals		
- Headlamps		
- Flashers		
- Cab		
- Boom		

EXHIBIT III
(SAMPLE FORM)

MOBILE CRANE PERIODIC INSPECTION REPORT

PERIODIC	**CODE**	**COMMENT**
- Backup		
Paint		
Cracks or Leaks:		
- Swing Gearbox Case		
- Transmission Case		
- Pump Drive Box		
- Engine Intake		
Boom Wear Pads		
Brake Liners		
Axle Planetary Hubs		
Cleaner		
Clutch Release Bearing		
Gear Shift Control		
Steering System Oil		
Crankcase Breather		
Tie Rod Ball Joints		
Steering Knuckles		
Drag Link U-joint		
Drag Link Ends		
Windshield Wiper		
Lever Indicator		
Emergency Brake		
Gauges: Oil, Fuel, Amp		
CIRCLE ONE:	**PASS**	**FAIL**
INSPECTOR (Print):	**Signature**:	**Date**:

INTENTIONALLY BLANK

EXHIBIT IV
(SAMPLE FORM)
Typical Preuse Inspection Procedures (sheet 1 of 2).
OPERATORS PRE-SHIFT INSPECTION
(ELECTRIC FORKLIFT)

Date_____ Vehicle No._____ Shift _____

Type and Model_____ Hour Meter _____

OK	*VISUAL CHECKS*	Maintenance Needed-Reported to:
	Leaks - Hydraulic Oil, Battery	
	Tires - Condition and pressure	
	Forks, Top Clip retaining pin and heel - Condition	
	Load Backrest Extension - solid attachment	
	Hydraulic hoses, Mast chains & Stops	
	Finger guards - attached	
	Safety warnings - attached and legible	
	Operators manual - Located on truck and legible	
	Capacity Plate - attached; information matches Model & Serial Nos. and attachments.	
	Seat Belt - Buckle and retractor working smoothly	
OPERATIONAL CHECKS *-Unusual Noises Must be Reported Immediately*		
	Accelerator Linkage	
	Parking Brake / Deadman	
	Steering	
	Drive Control - Forward and Reverse	
	Tilt Control - Forward and Back	
	Hoist & Lowering Control	
	Attachment Control	
	Horn	
	Lights	
	Back-Up Alarm	
	Hour Meter	
	Battery Discharge Gauge	

Daily Pre-Shift Inspections are an OSHA requirement. We recommend that you document that these inspections have been made.

Inspected by:_____
_____

Custodian:_____

EXHIBIT IV
(SAMPLE FORM)

Typical Peruse Inspection Procedures (sheet 2 of 2).
OPERATORS PRE-SHIFT INSPECTION
(GAS, LP, or DIESEL FORKLIFT)

Date_____ Vehicle No._____ Shift _____

Type and Model_____ Hour Meter _____

OK	***VISUAL CHECKS***	Maintenance Needed-Reported to:
	Fluid Levels -Oil , Radiator , Hydraulic	
	Leaks - Hydraulic Oil, Battery, Fuel	
	Tires - Condition and pressure	
	Forks, Top Clip retaining pin and heel - Condition	
	Load Backrest Extension - solid attachment	
	Hydraulic hoses, Mast chains & Stops	
	Finger guards - attached	
	Safety warnings - attached and legible	
	Operators manual - Located on truck and legible	
	Capacity Plate - attached; information matches Model & Serial Nos. and attachments.	
	Seat Belt - Buckle and retractor working smoothly	
OPERATIONAL CHECKS *-Unusual Noises Must be Reported Immediately*		
	Accelerator Linkage	
	Parking Brake	
	Steering	
	Drive Control - Forward and Reverse	
	Tilt Control - Forward and Back	
	Hoist & Lowering Control	
	Attachment Control	
	Horn	
	Lights	
	Back-Up Alarm	
	Hour Meter	

Daily Pre-Shift Inspections are an OSHA requirement. We recommend that you document that these inspections have been made.

Inspected by:_____

Custodian:_____

EXHIBIT V
(SAMPLE FORM)

PERSONNEL LIFT PLATFORM PRE-LIFT INSPECTION

Inspector: _____ Date: _____

Platform Identification Number: _____

1. Trial Lift Completed with anticipated lift weight: _____ (lbs. or kg)

2. Markings:	Satisfactory	Unsatisfactory
Platform (All Information Legible)	( )	( )
Suspension System	( )	( )
3. Structure		
Load Supporting Welds/Bolts	( )	( )
Load Supporting Members	( )	( )
Barrier From Toe Board to Intermediate Rail	( )	( )
Hand Rail	( )	( )
Fall Protection Device Anchorage Points	( )	( )
Gate Locking Mechanisms	( )	( )
Platform Flooring	( )	( )
Suspension Attachment Points	( )	( )
4. Attachment Mechanisms		
Pins/Ears/Bolt-Up's/eyes (circle)	( )	( )
Wire Rope/Chains/Rigid Leg (circle)	( )	( )
Master Links	( )	( )
5. Special Purpose Items (i.e., Overhead Protection, Floatation, Platform Controls)		
List: 1) _____	( )	( )
2) _____	( )	( )
3) _____	( )	( )

6. General Comments: _____

Designated Leader Signature: _____ Date: _____

INTENTIONALLY BLANK

EXHIBIT VI
(SAMPLE FORM)

PERSONNEL LIFTING PLANNING AND AUTHORIZATION FORM

1. Location: _____ Date: _____
2. Purpose of Lift: _____
3. Hoisting Equipment Manufacturer: _____
   Model Number: _____
   Serial Number: _____
4. Expected Radius: _____ (Maximum)
   _____ (At Work Location)
5. (A) Rated Load at Radius: _____
   _____
   _____
   (B) Maximum Lifted Load (50% of 5A):
6. (A) Platform Identification: _____
   (B) Platform Rating: _____
7. Platform Weight: _____
8. (A) Number of Platform Occupants: _____
   (B) Approximate Weight (with equipment): _____
9. Total Lift Weight: _____ [(7 + 8B)(No more than 5B above)]
10. Personnel Lift Supervisor: _____
11. What are the alternatives to this personnel lift? _____
    _____
    _____
12. Why are they not being used? _____
    _____
13. Pre-Lift Briefing Held: ____/____/____ Time: _____ AM/PM
    Attendees: _____
    _____
    _____
14. Anticipated Hazards (wind, weather, visibility, power lines): _____
    _____
    _____
    _____
15. Lift Accomplished Date: ____/____/____ Time: _____ AM/PM
16. Remarks: _____
    _____
    _____

Designated Leader Signature: _____ Date: _____

INTENTIONALLY BLANK